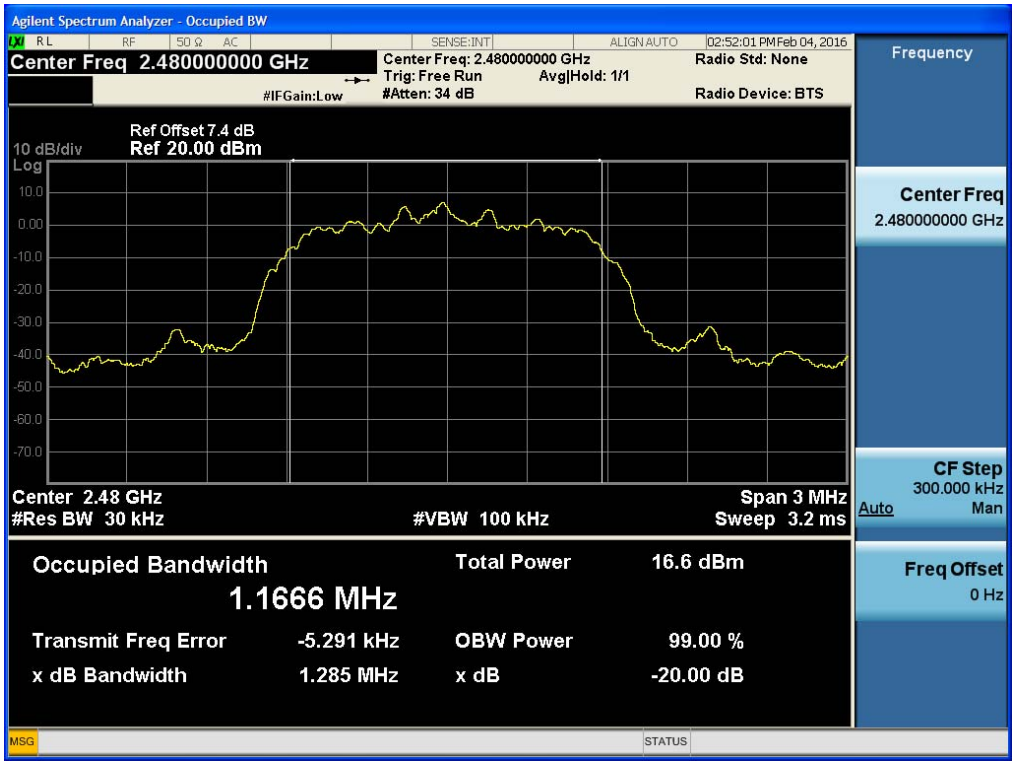
Test Plots (π/4DQPSK)

20 dB Bandwidth & Occupied Bandwidth (High-CH)

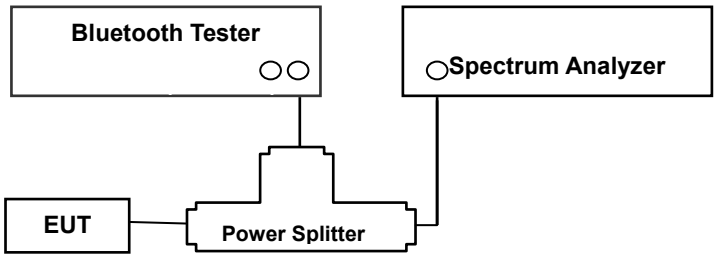


## 8.4 NUMBER OF HOPPING FREQUENCY

**LIMIT**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands shall use at least 15 hopping frequencies.

**Test Configuration**




**TEST PROCEDURE**

The Bluetooth frequency hopping function of the EUT was enabled.

The Spectrum Analyzer is set to (7.8.3 in ANSI 63.10-2013)

1) Span: the frequency band of operation
2) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3) VBW ≥ RBW
4) Sweep: Auto
5) Detector: Peak
6) Trace: Max hold
7) Allow the trace to stabilize.

**TEST RESULTS**

No non-compliance noted

**Test Data**

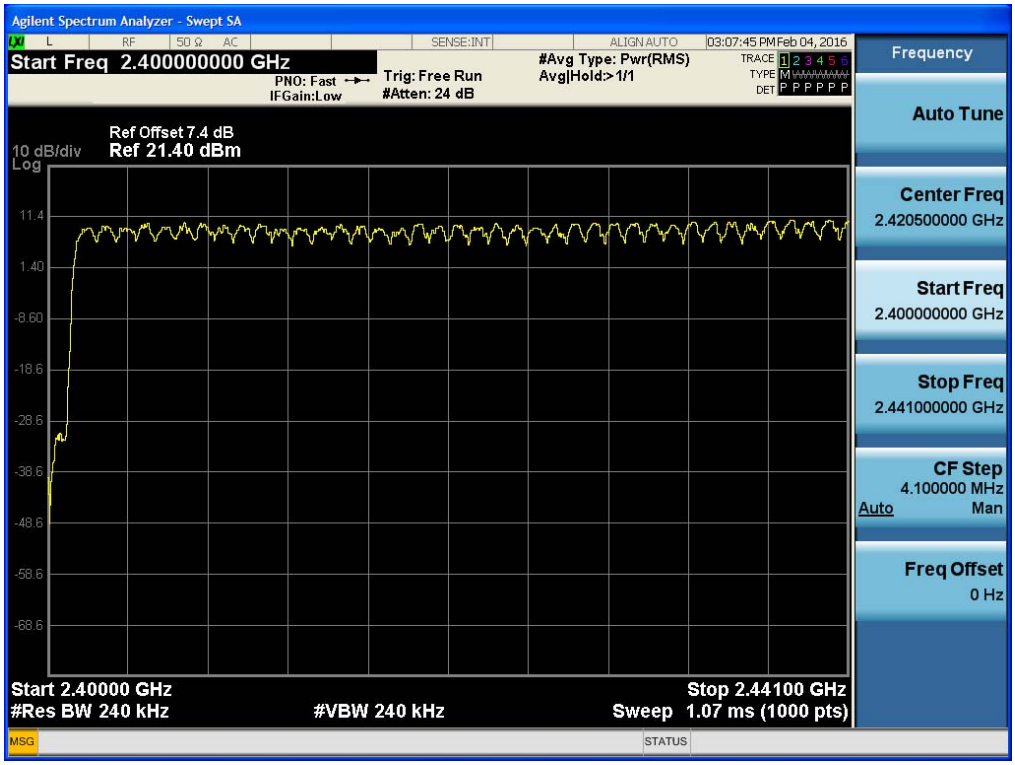
| Result (No. of CH) | | | Limit | Result |
|---|---|---|---|---|
| GFSK | 8DPSK | π/4DQPSK | | |
| 79 | 79 | 79 | >15 | Pass |

**Note : In case of AFH mode, minimum number of hopping channels is 20.**

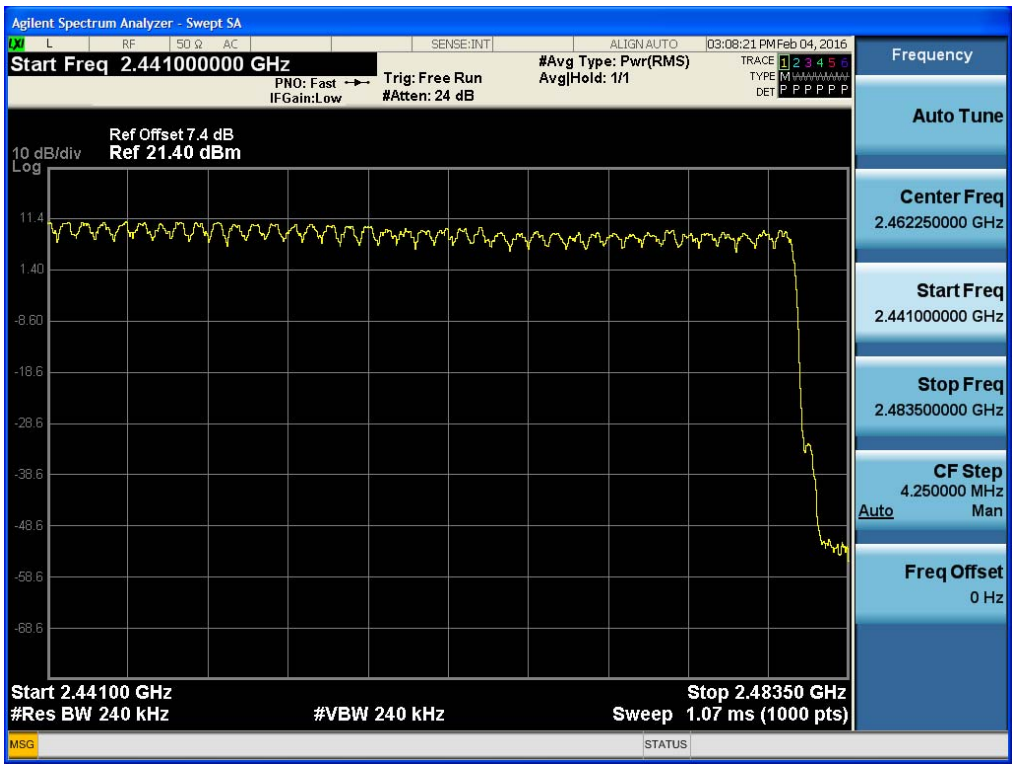
Test Plots (GFSK)
Number of Channels (2.4 GHz - 2.441 GHz)

Test Plots (GFSK)
Number of Channels (2.441 GHz - 2.4835 GHz)

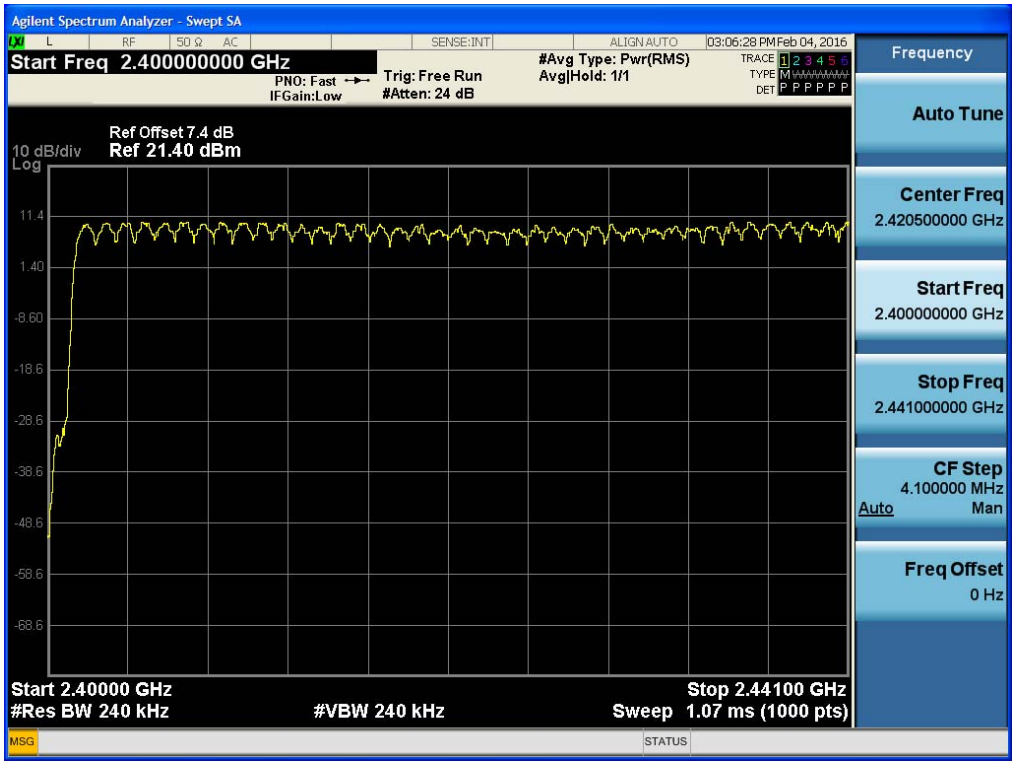
Test Plots (8DPSK)
Number of Channels (2.4 GHz - 2.441 GHz)



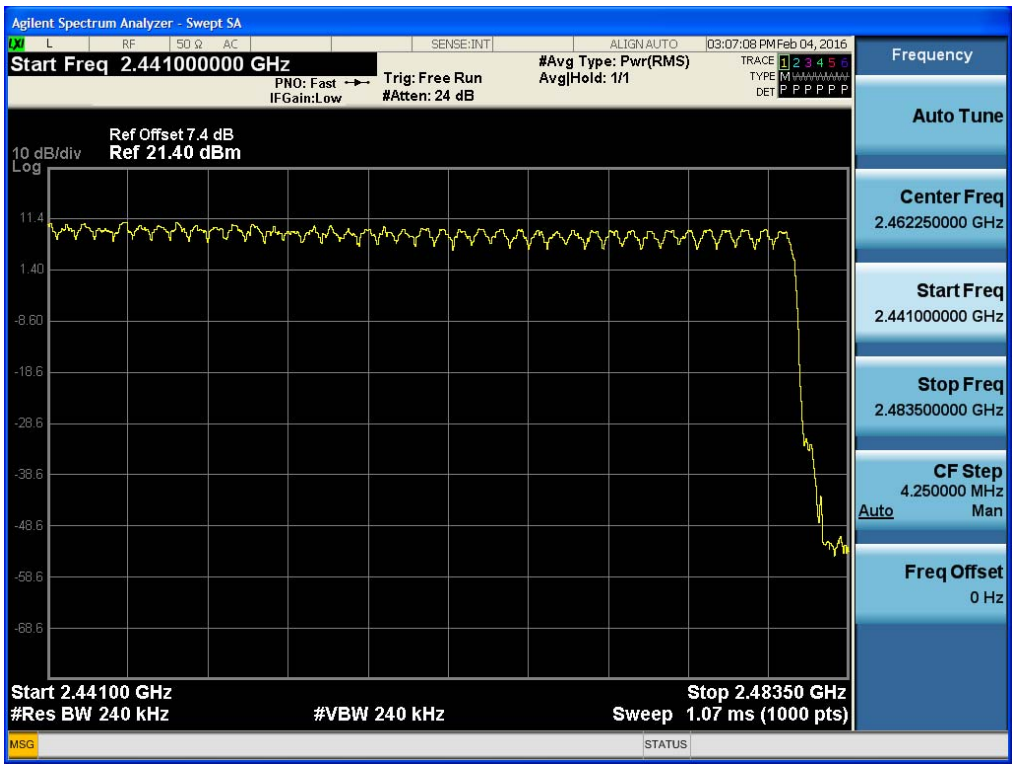

Test Plots (8DPSK)
Number of Channels (2.441 GHz - 2.4835 GHz)



Test Plots (π/4DQPSK)
Number of Channels (2.4 GHz - 2.441 GHz)




Test Plots (π/4DQPSK)
Number of Channels (2.441 GHz - 2.4835 GHz)

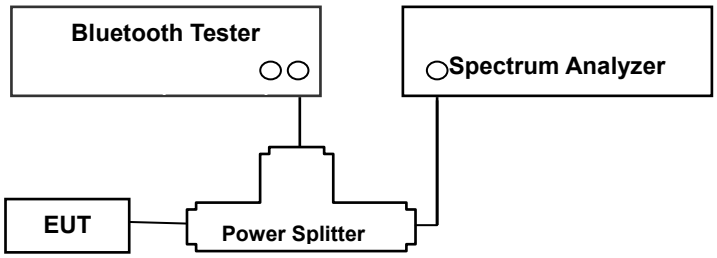


## 8.5 TIME OF OCCUPANCY (DWELL TIME)

**LIMIT**

According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

**Test Configuration**




**TEST PROCEDURE**

This test is performed with hopping off.

EUT was set to transmit the longest packet type (DH5)

The Spectrum Analyzer is set to (7.8.4 in ANSI 63.10-2013)

1) Span: Zero span, centered on a hopping channel
2) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3) Sweep = as necessary to capture the entire dwell time per hopping channel
4) Detector: Peak
5) Trace: Max hold

The marker-delta function was used to determine the dwell time.

**Normal Mode / EDR Mode**

**DH 5**(The longest packet type for GFSK)

CH Mid : 2.885 * (1600/6)/79 * 31.6 = 307.73 (ms)

**2-DH 5**(The longest packet type for π/4DQPSK)

CH Mid : 2.890 * (1600/6)/79 * 31.6 = 308.27 (ms)

**3-DH 5**(The longest packet type for 8DPSK)

CH Mid : 2.885 * (1600/6)/79 * 31.6 = 307.73 (ms)

**AFH Mode**

**DH 5**(The longest packet type for GFSK)

CH Mid : 2.885 * (800/6)/20 * 8.0 = 153.87 (ms)

**2-DH 5**(The longest packet type for π/4DQPSK)

CH Mid : 2.890 * (800/6)/20 * 8.0 = 154.13 (ms)

**3-DH 5**(The longest packet type for 8DPSK)

CH Mid : 2.885 * (800/6)/20 * 8.0 = 153.87 (ms)

Note :

A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.7 times of appearance. Each tx-time per appearance of DH5 is 2.892 ms.

Dwell time = Tx-time * 106.7

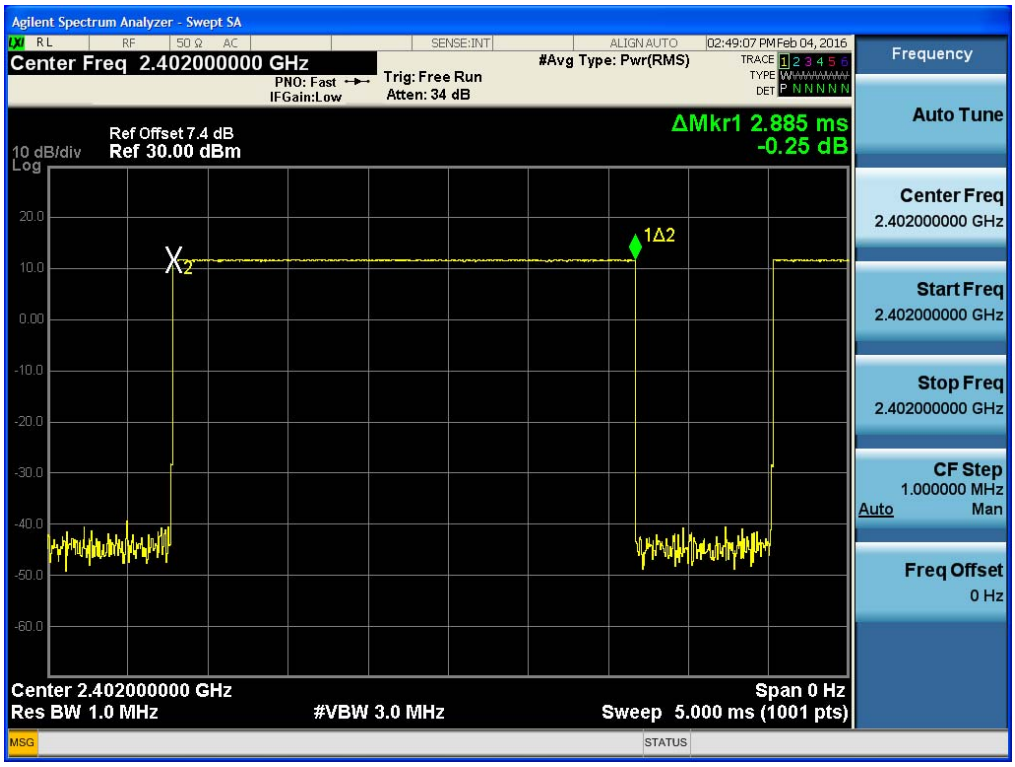
**TEST RESULTS**

See the table.

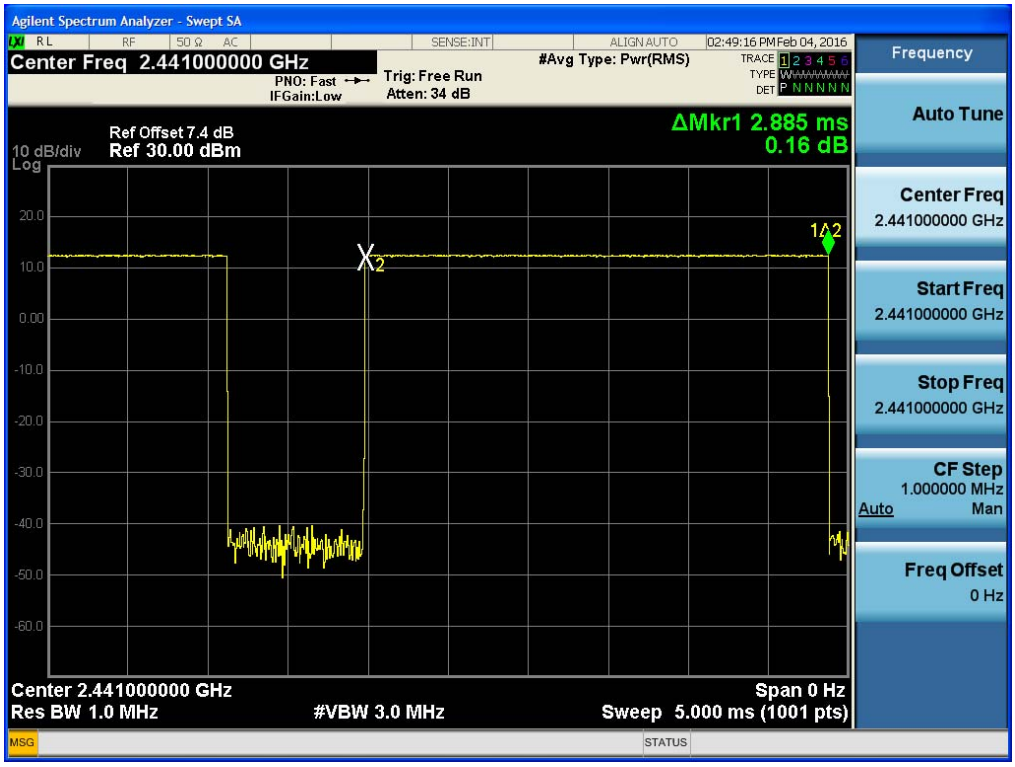
| | **Channel** | **GFSK** | **8DPSK** | **π/4DQPSK** |
|---|---|---|---|---|
| Pulse Time (ms) | Low | 2.885 | 2.890 | 2.890 |
| | Mid | 2.885 | 2.890 | 2.885 |
| | High | 2.885 | 2.890 | 2.890 |

| | **Channel** | **GFSK** | **8DPSK** | **π/4DQPSK** | **Period Time (s)** | **Limit (ms)** | **Result** |
|---|---|---|---|---|---|---|---|
| Total of Dwell (ms) | Low | 307.73 | 308.27 | 308.27 | 31.6 | 400 | PASS |
| | Mid | 307.73 | 308.27 | 307.73 | 31.6 | | PASS |
| | High | 307.73 | 308.27 | 308.27 | 31.6 | | PASS |

Test Plots (GFSK)
Dwell Time (Low-CH)

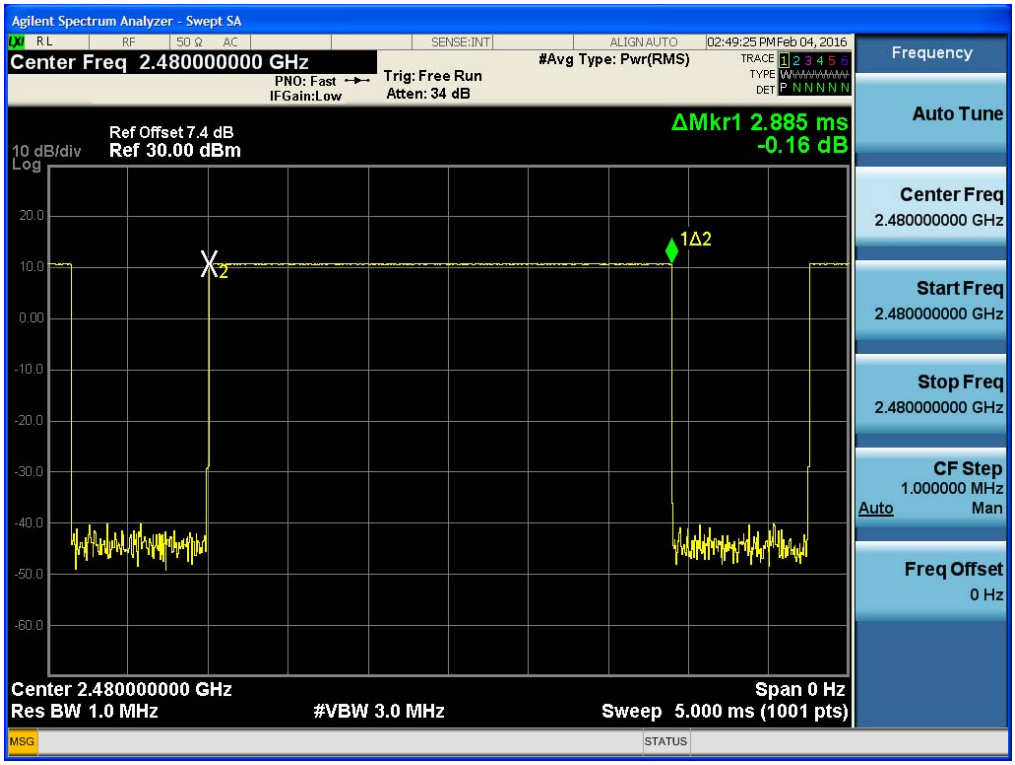



Test Plots (GFSK)
Dwell Time (Mid-CH)



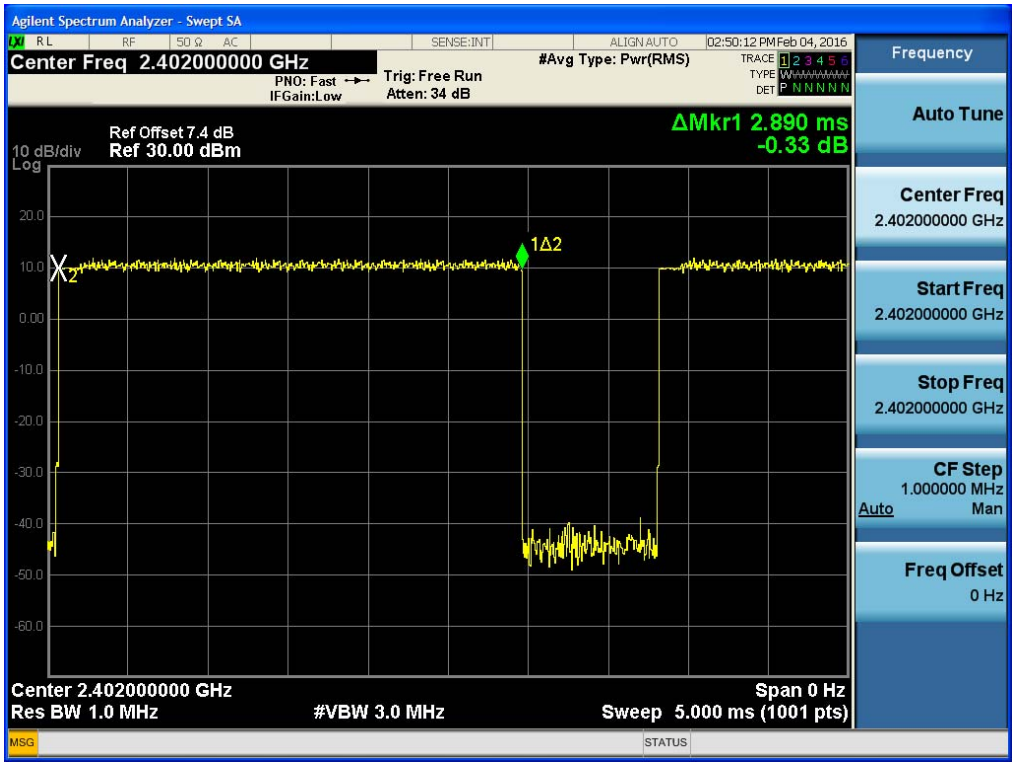
Test Plots (GFSK)

Dwell Time (High-CH)

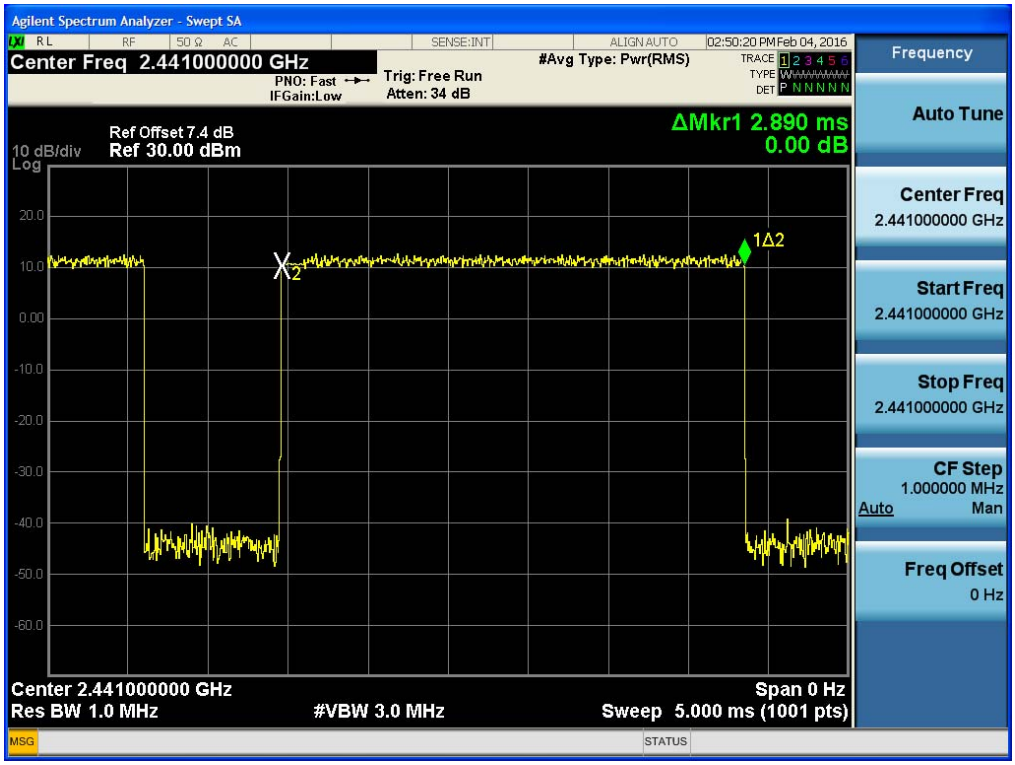



Test Plots (8DPSK)

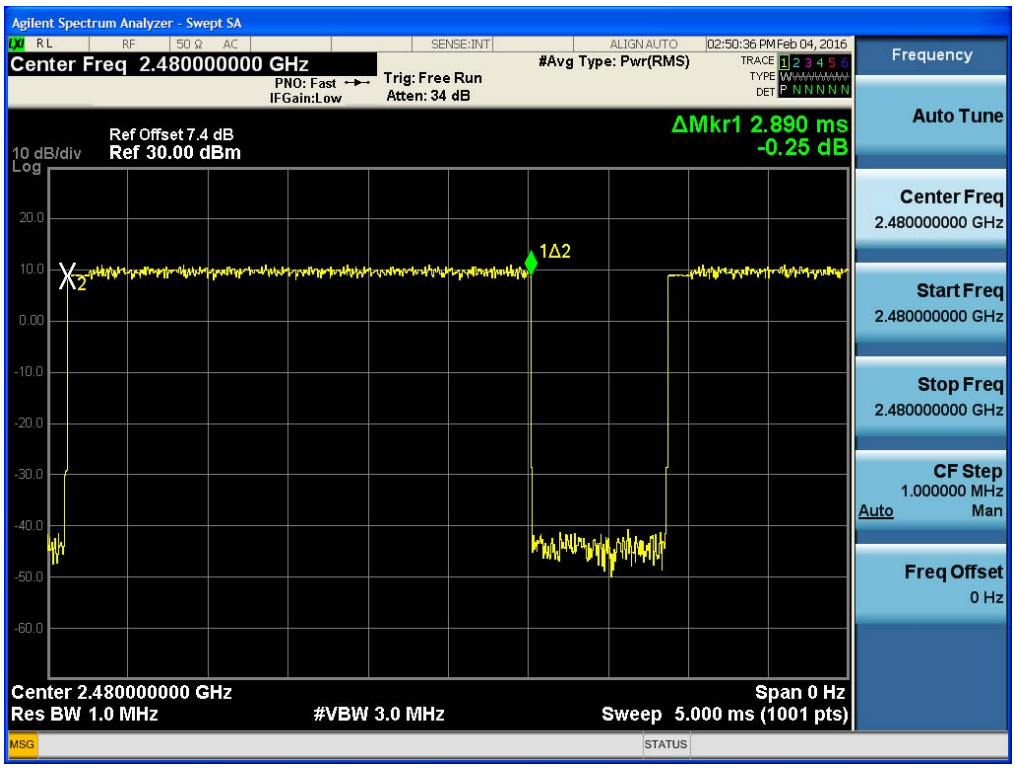
Dwell Time (Low-CH)



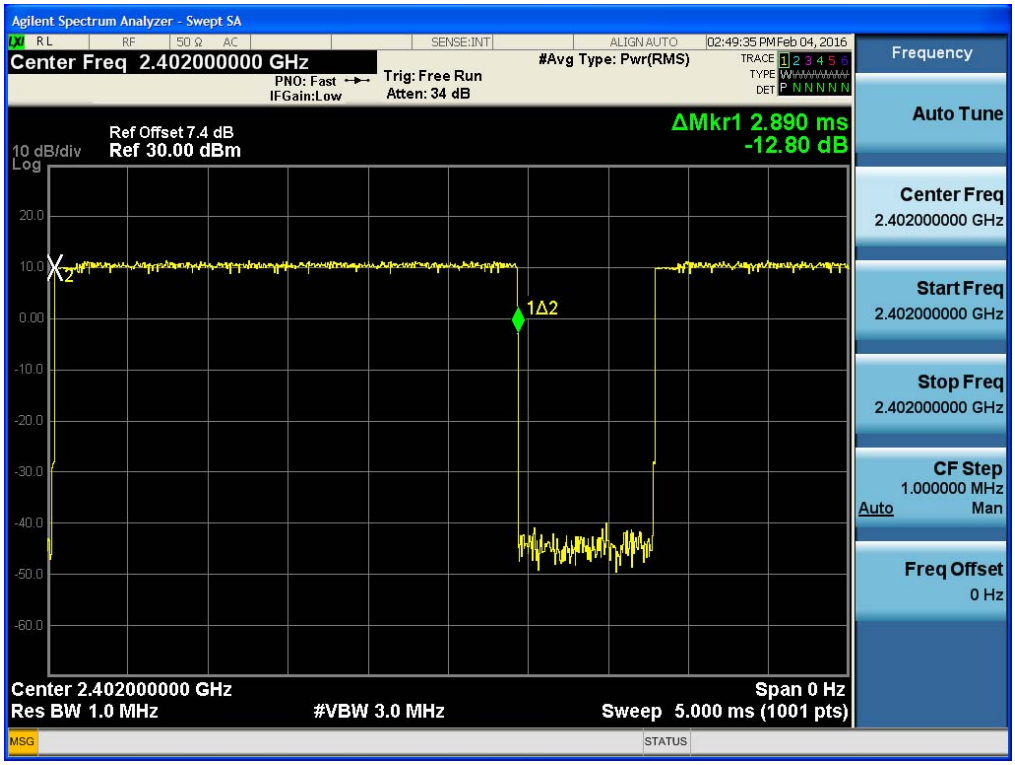
Test Plots (8DPSK)
Dwell Time (Mid-CH)



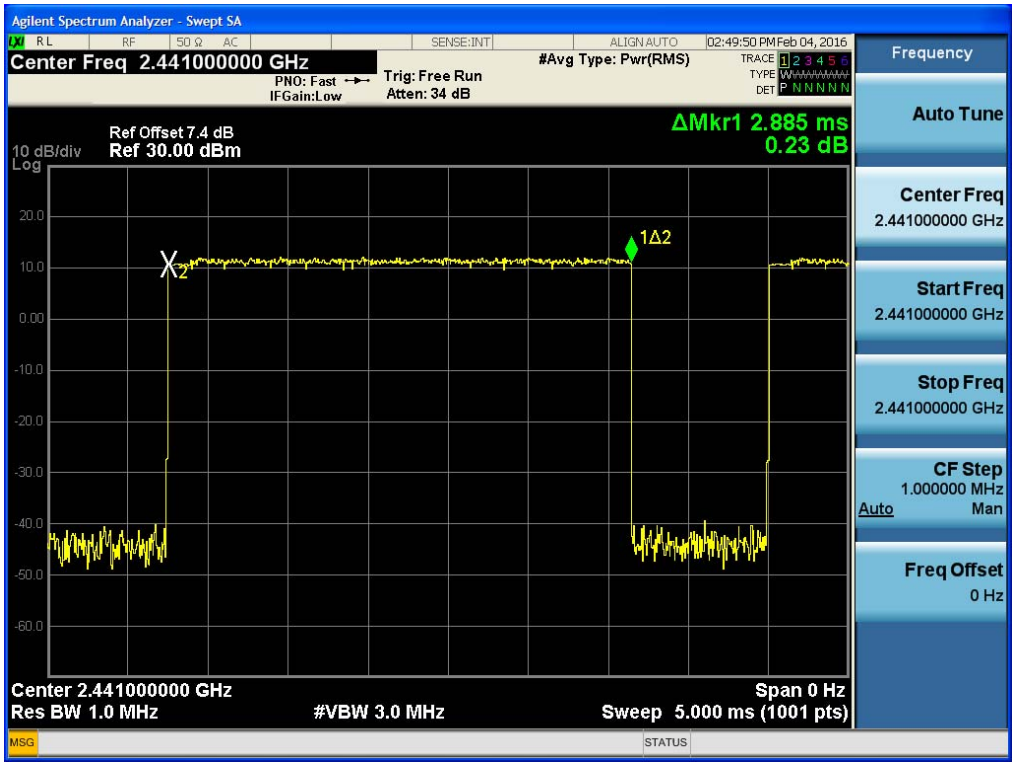

Test Plots (8DPSK)
Dwell Time (High-CH)



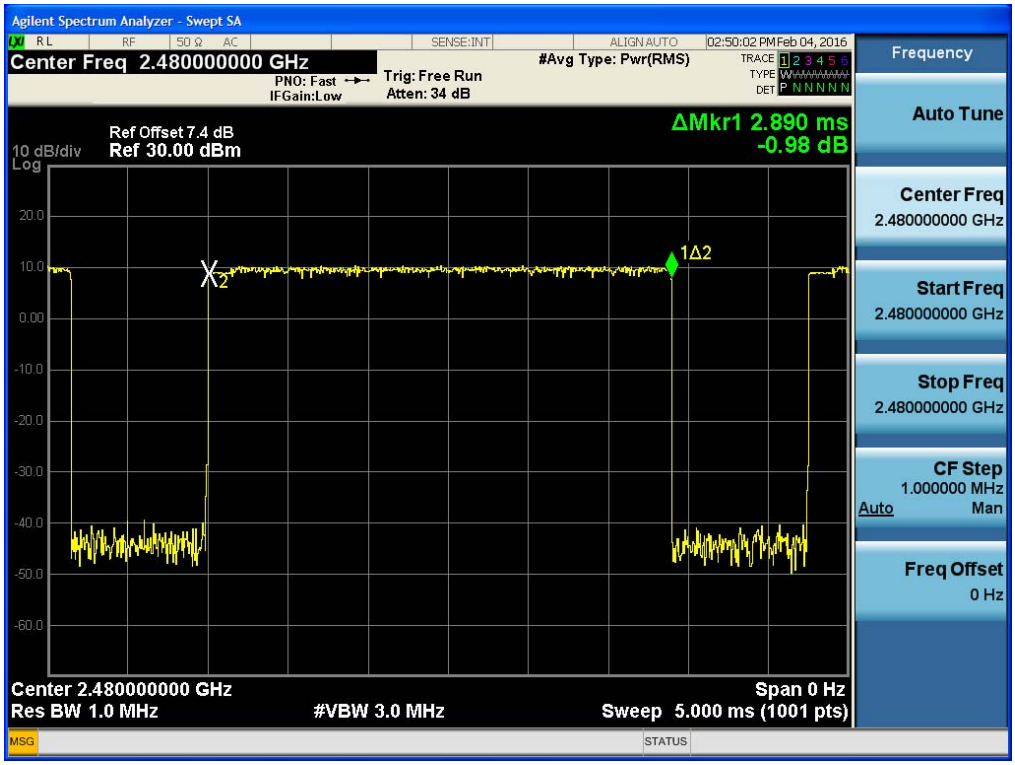
Test Plots (π/4DQPSK)
Dwell Time (Low-CH)




Test Plots (π/4DQPSK)
Dwell Time (Mid-CH)



Test Plots (π/4DQPSK)
Dwell Time (High-CH)



## 8.6 SPURIOUS EMISSIONS

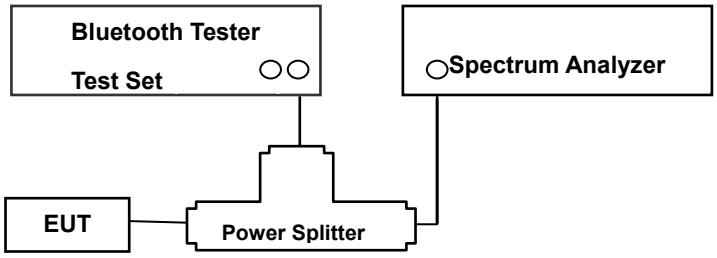
### 8.6.1 CONDUCTED SPURIOUS EMISSIONS

**Test Requirements and limit, §15.247(d)**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

**Limit : 20 dBc**

**Test Configuration**




**TEST PROCEDURE**

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer.

The Spectrum Analyzer is set to (7.8.8 in ANSI 63.10-2013)

1) Span: 30 MHz to 10 times the operating frequency in GHz.
2) RBW: 100 kHz
3) VBW: 300 kHz
4) Sweep: Coupled
5) Detector: Peak

Measurements are made over the 30 MHz to 26 GHz range with the transmitter set to the lowest, middle, and highest channels.

This test is performed with hopping off.

## TEST RESULTS

No non-compliance noted.

Note : In order to simplify the report, attached plots were only the worst case channel and data rate.

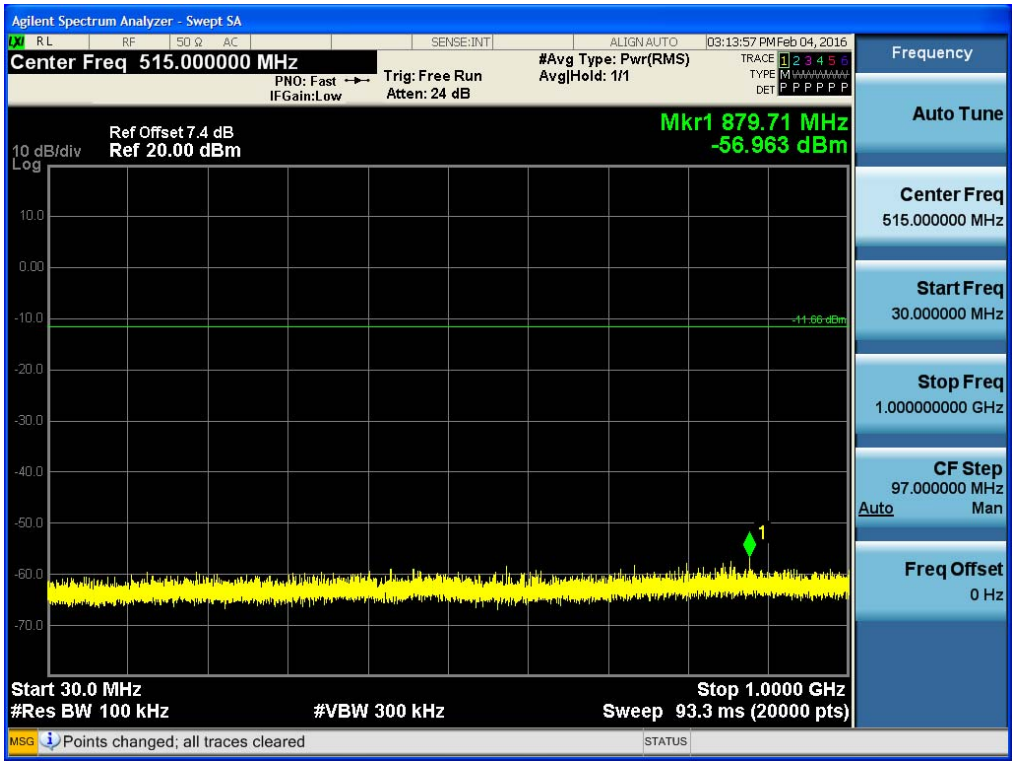
## FACTORS FOR FREQUENCY

| Freq(MHz) | Factor(dB) |
|---|---|
| 30 | 7.18 |
| 100 | 6.35 |
| 200 | 7.04 |
| 300 | 6.58 |
| 400 | 6.26 |
| 500 | 5.95 |
| 600 | 6.17 |
| 700 | 6.34 |
| 800 | 6.72 |
| 900 | 7.08 |
| 1000 | 7.38 |
| 2000 | 7.78 |
| 2400* | 7.36 |
| 2500* | 7.44 |
| 3000 | 7.88 |
| 4000 | 8.95 |
| 5000 | 9.57 |
| 6000 | 6.68 |
| 7000 | 9.99 |
| 8000 | 8.34 |
| 9000 | 9.61 |
| 10000 | 10.47 |
| 11000 | 8.96 |
| 12000 | 9.73 |
| 13000 | 8.84 |
| 14000 | 9.50 |
| 15000 | 11.54 |
| 16000 | 8.14 |
| 17000 | 11.73 |
| 18000 | 9.71 |
| 19000 | 10.40 |
| 20000 | 11.69 |
| 21000 | 10.72 |
| 22000 | 12.31 |
| 23000 | 9.85 |
| 24000 | 12.52 |
| 25000 | 11.07 |
| 26000 | 10.50 |

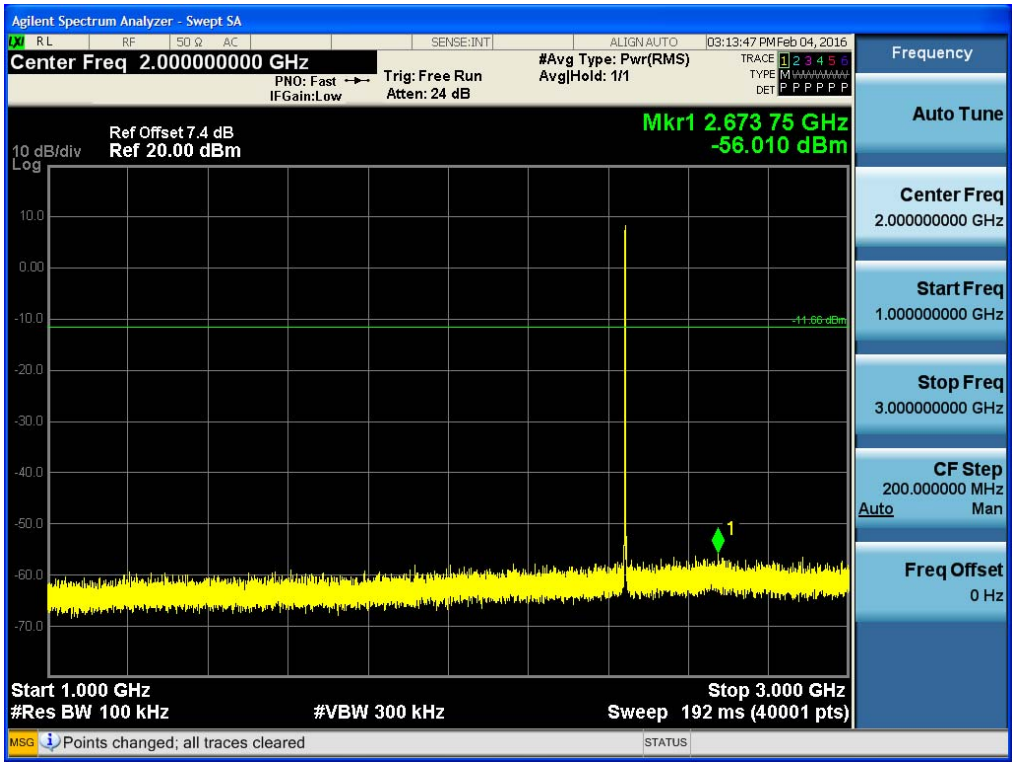
Note : 1. '*' is fundamental frequency range.

2. Factor = Cable loss + Splitter loss

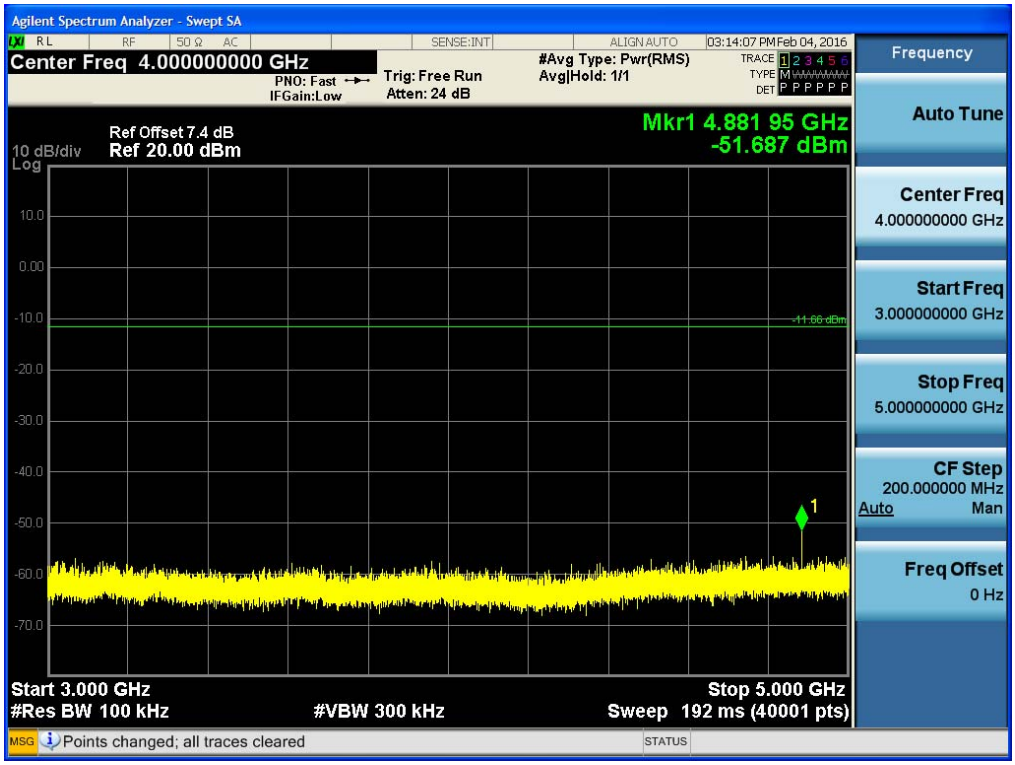
Test Plots (8DPSK)- 30 MHz - 1 GHz
Spurious Emission (Mid-CH)



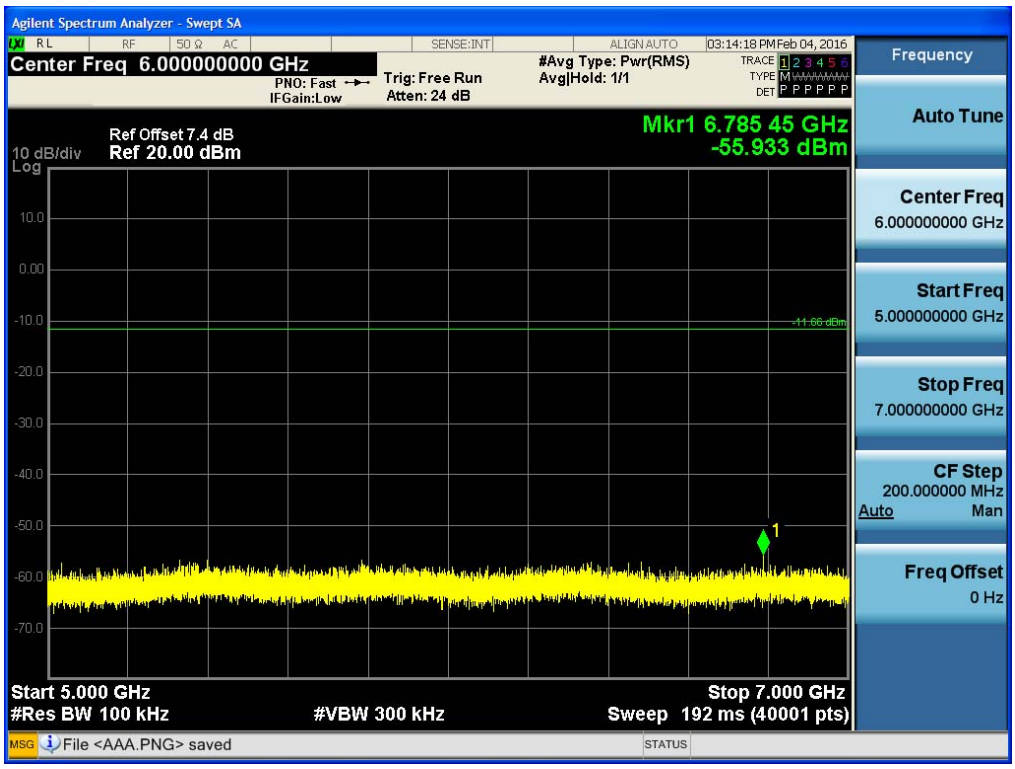

Test Plots (8DPSK)- 1 GHz – 3 GHz
Spurious Emission (Mid-CH)



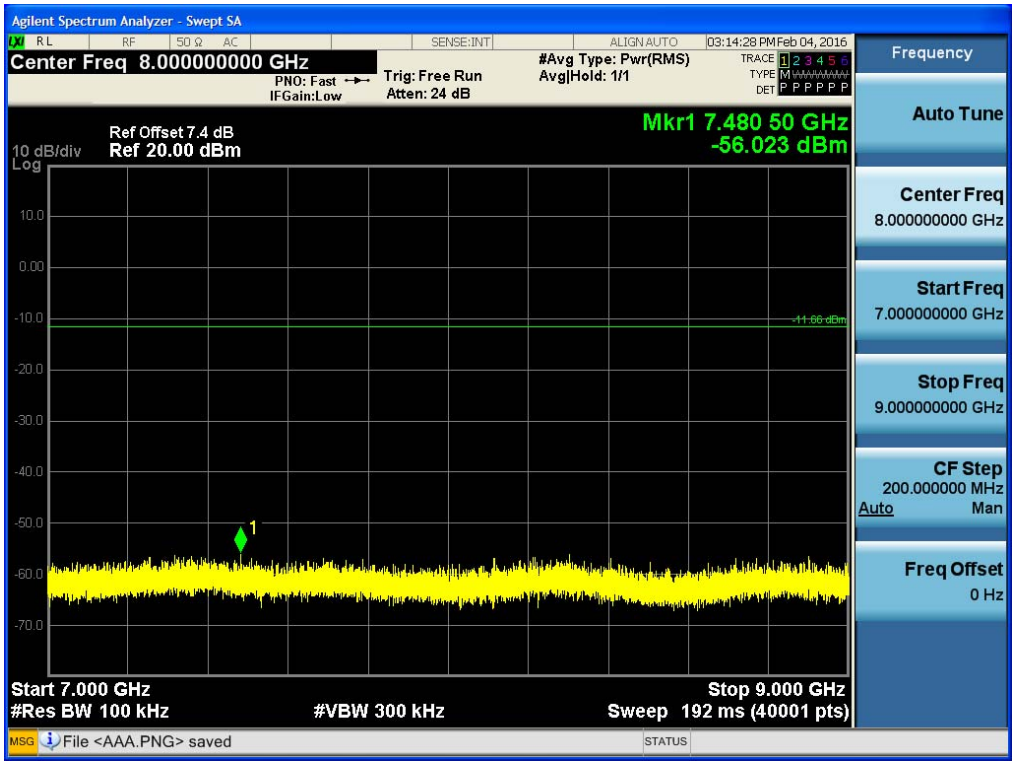
Test Plots (8DPSK)- 3 GHz - 5 GHz
Spurious Emission (Mid-CH)



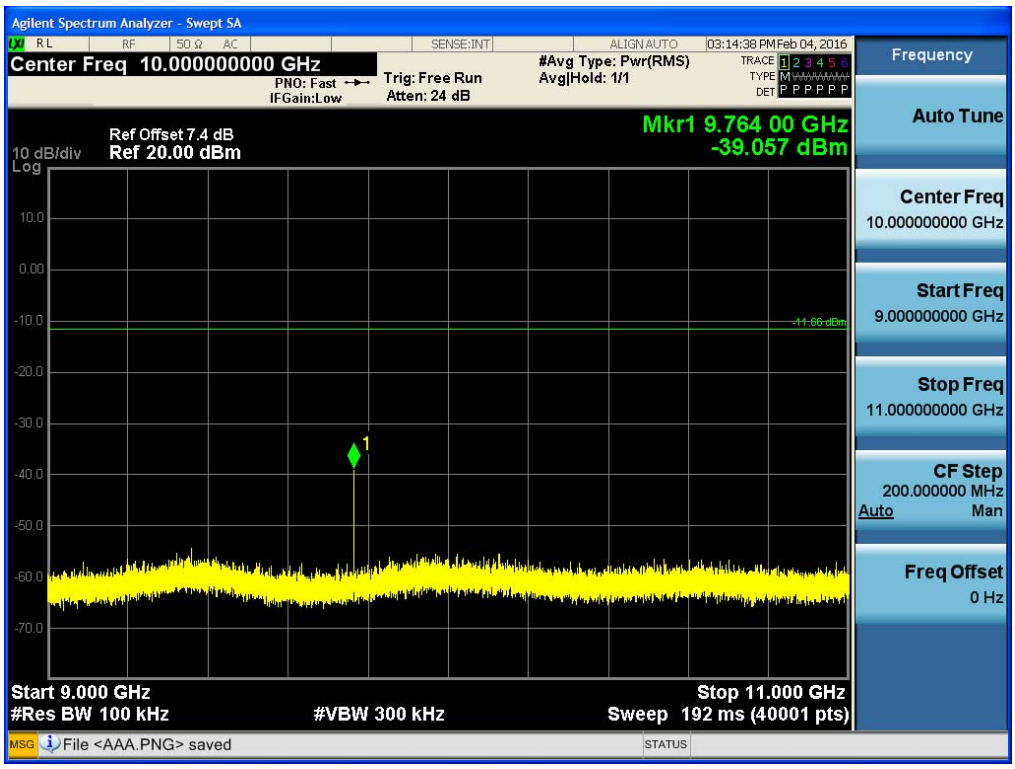

Test Plots (8DPSK)- 5 GHz - 7 GHz
Spurious Emission (Mid-CH)



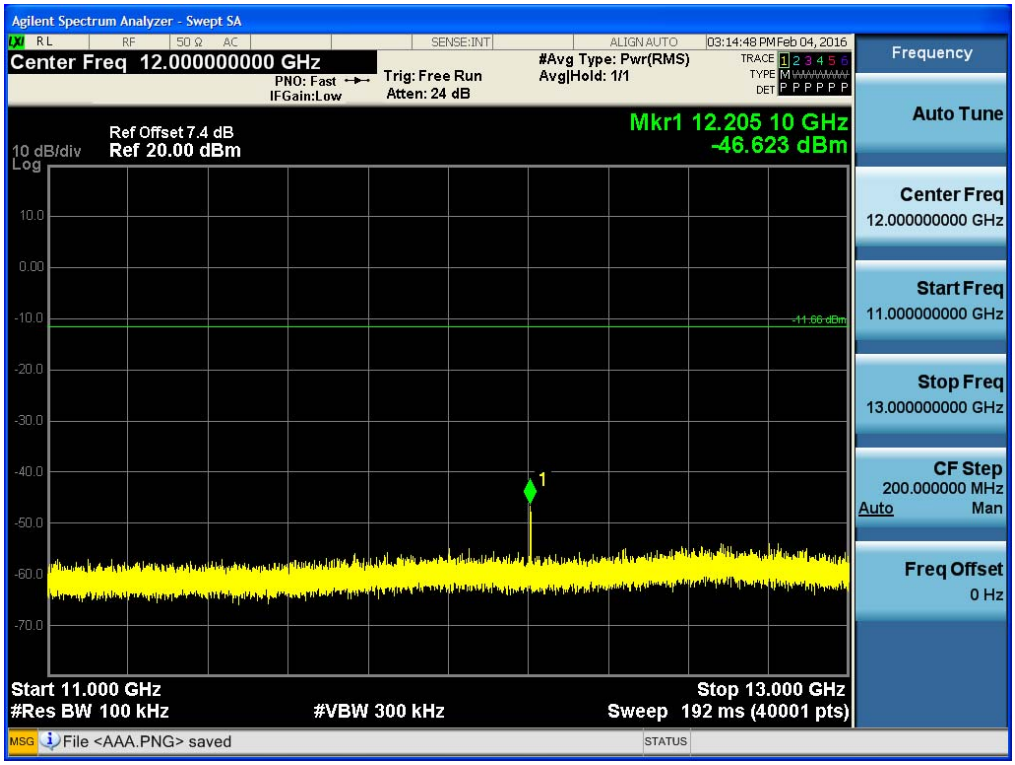
Test Plots (8DPSK)- 7 GHz - 9 GHz
Spurious Emission (Mid-CH)



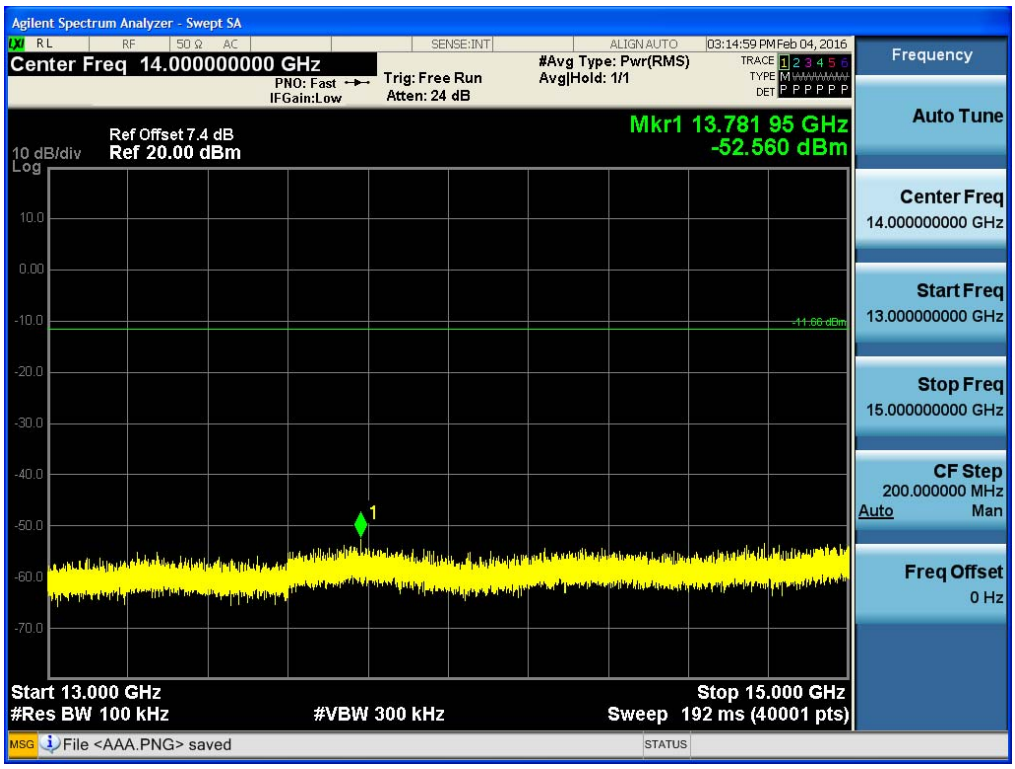

Test Plots (8DPSK)- 9 GHz - 11 GHz
Spurious Emission (Mid-CH)



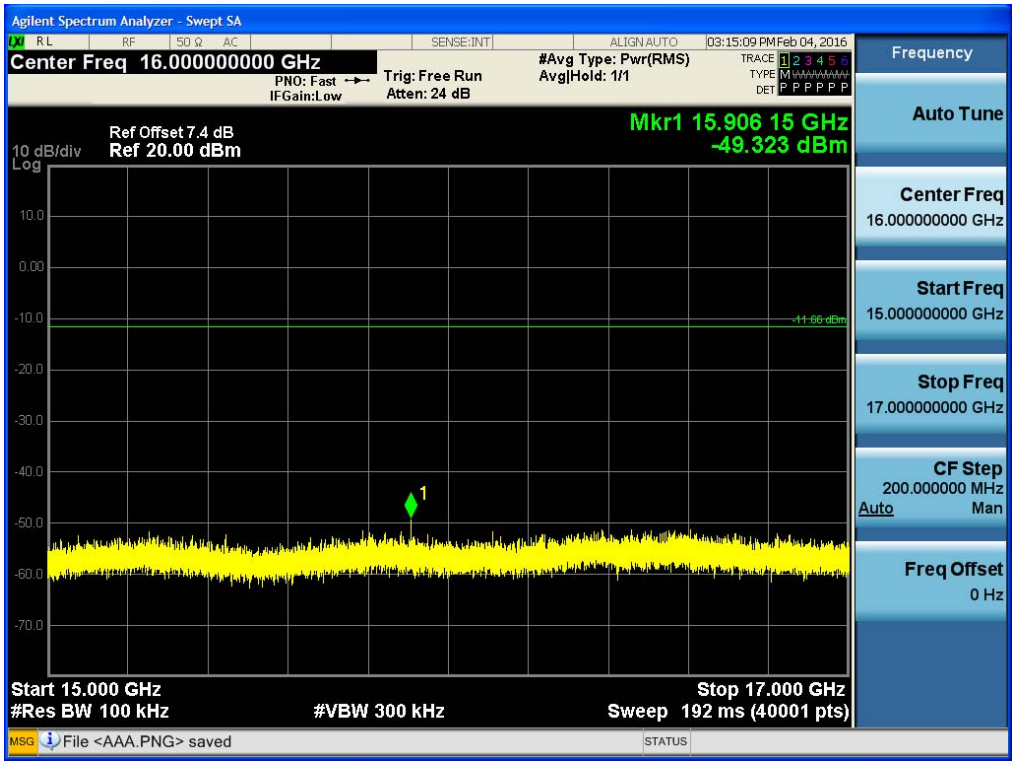
Test Plots (8DPSK)- 11 GHz - 13 GHz
Spurious Emission (Mid-CH)



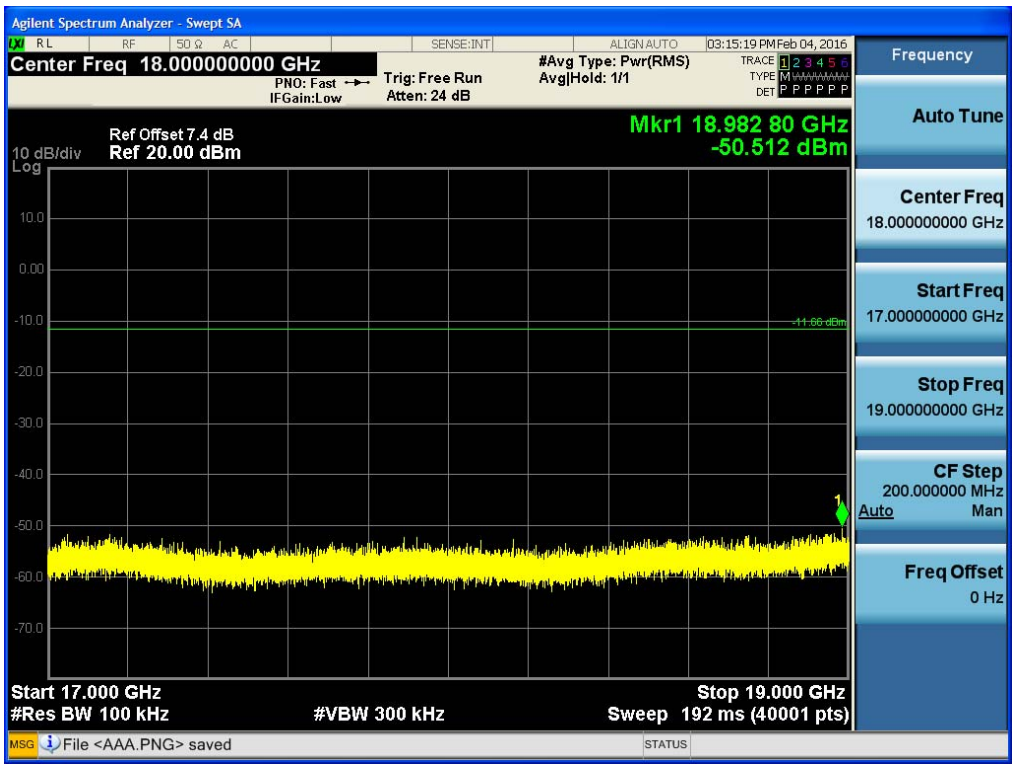

Test Plots (8DPSK)- 13 GHz – 15 GHz
Spurious Emission (Mid-CH)



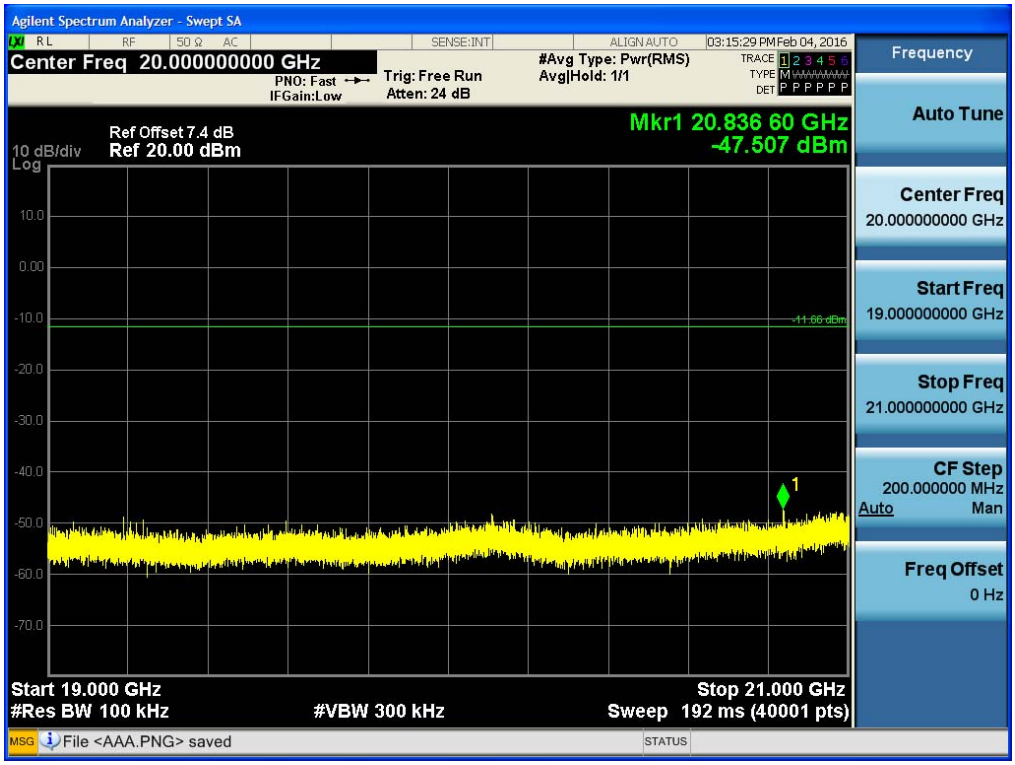
Test Plots (8DPSK)– 15 GHz - 17 GHz
Spurious Emission (Mid-CH)



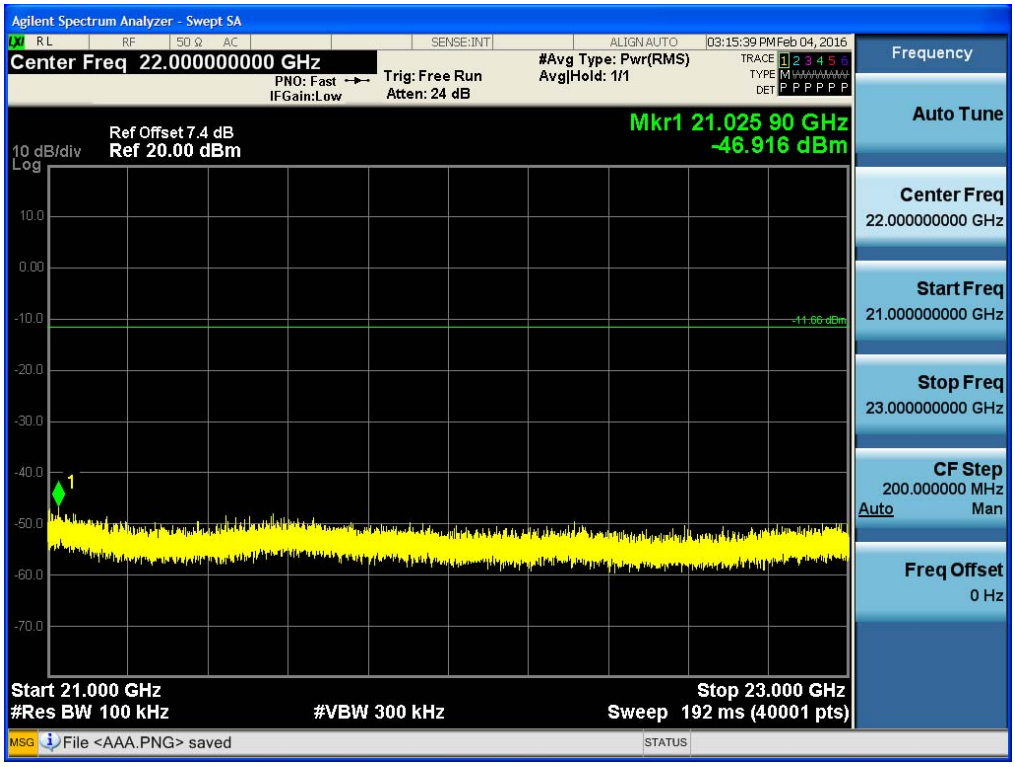

Test Plots (8DPSK)- 17 GHz - 19 GHz
Spurious Emission (Mid-CH)



Test Plots (8DPSK)- 19 GHz - 21 GHz
Spurious Emission (Mid-CH)

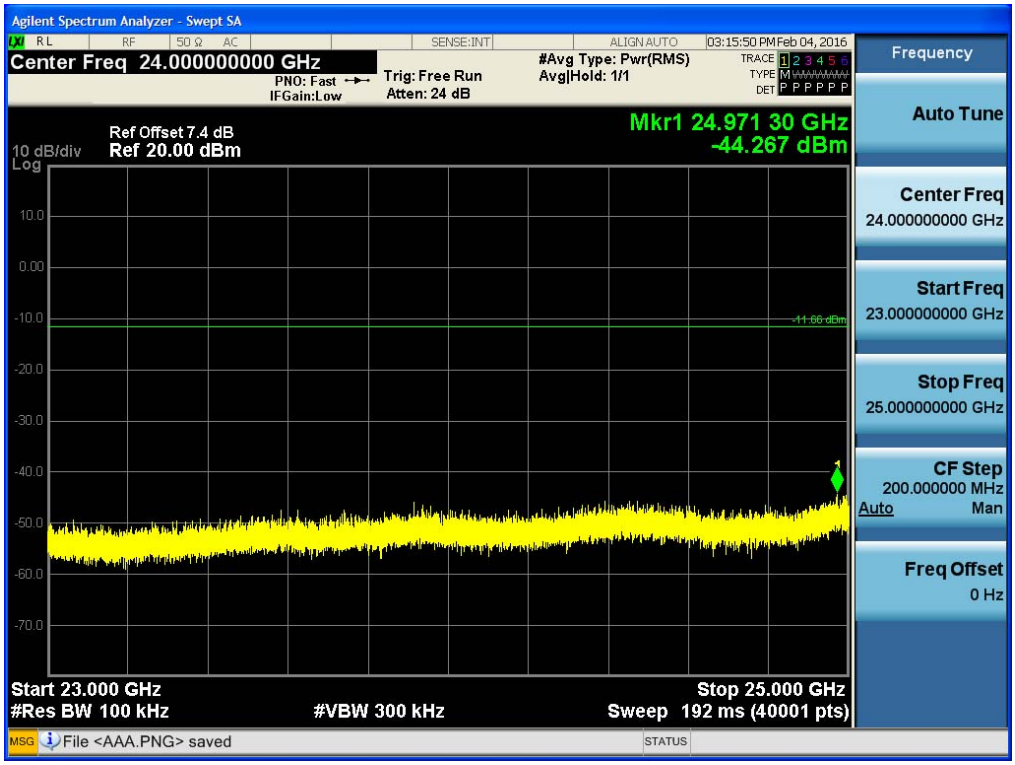



Test Plots (8DPSK)- 21 GHz - 23 GHz
Spurious Emission (Mid-CH)



Test Plots (8DPSK)- 23 GHz - 25 GHz

Spurious Emission (Mid-CH)



### 8.6.2 RADIATED SPURIOUS EMISSIONS

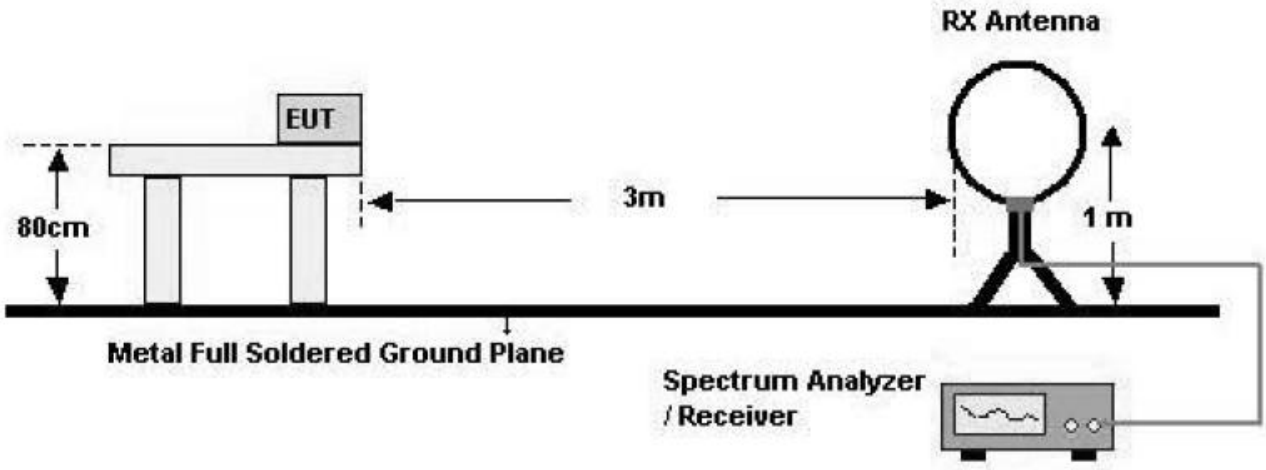
**LIMIT : §15.247(d), §15.205, §15.209**

1. 20dBc in any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

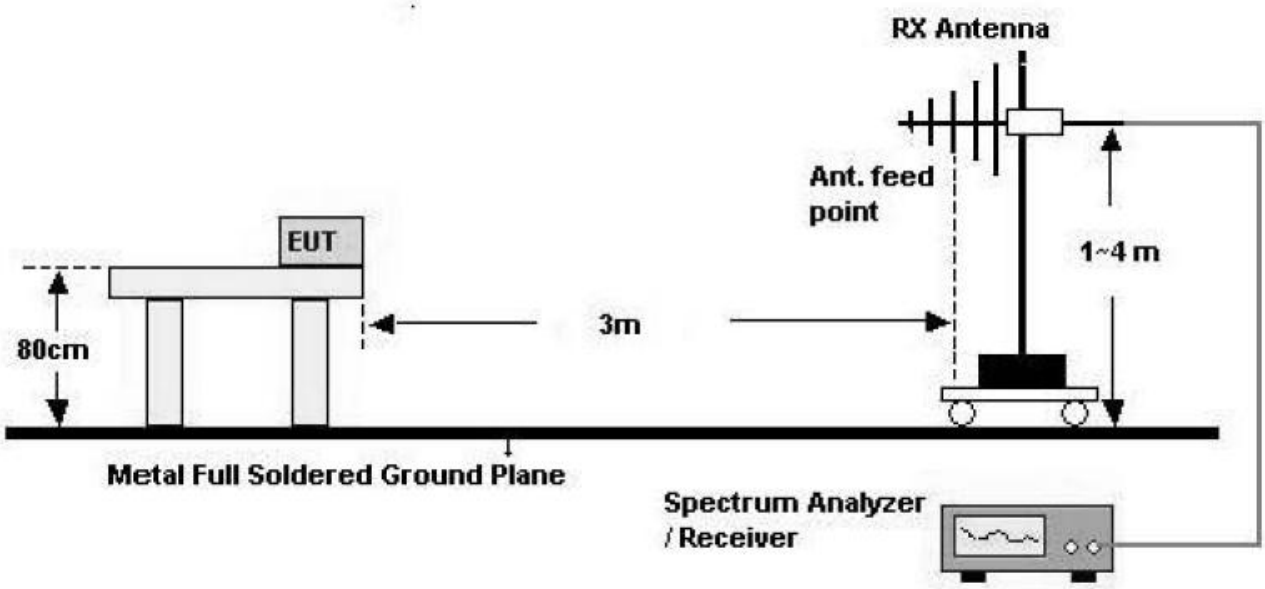
| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|---|---|---|
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

**Test Configuration**

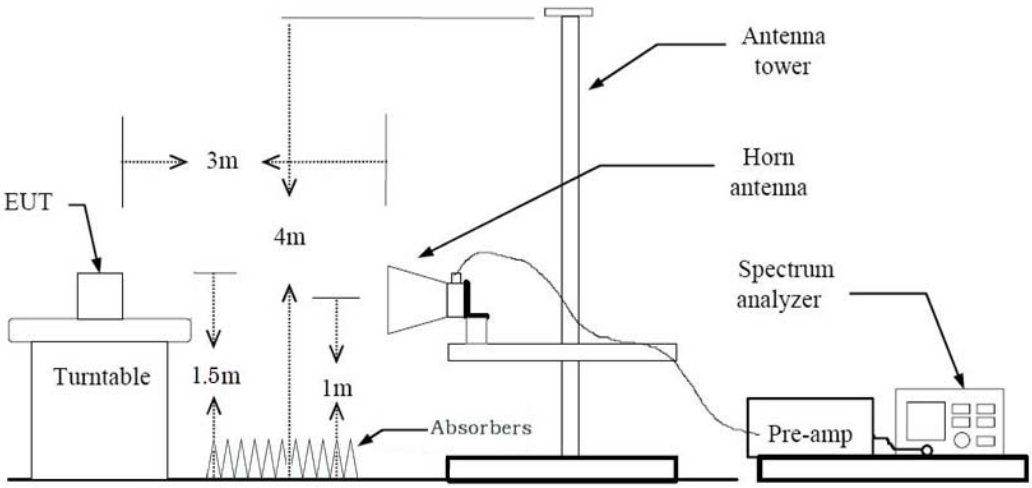
**Below 30 MHz**




**30 MHz - 1 GHz**



**Above 1 GHz**




**TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum Setting
   a. Peak: 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥3*RBW
   b. Average: 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.

Note :

1. We are performed the RSE and radiated band edge using standard radiated method.
2. The duty cycle factor for BT mode.

| BT Mode | $T_{on}$ (ms) | VBW(1/T) (Hz) | The actual setting value of VBW (Hz) |
|---|---|---|---|
| GFSK | 2.885 | 347 | 1000 |
| π/4DQPSK | 2.890 | 346 | 1000 |
| 8DPSK | 2.890 | 346 | 1000 |

**TEST RESULTS**

**9 kHz – 30MHz**

**Operation Mode:** Normal Mode

| Frequency | Reading | Ant. factor | Cable loss | Ant. POL | Total | Limit | Margin |
|---|---|---|---|---|---|---|---|
| MHz | dBμV | dB /m | dB | (H/V) | dBμV/m | dBμV/m | dB |
| No Critical peaks found | | | | | | | |

**Notes:**

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. This test is performed with hopping off.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

**TEST RESULTS**

**Below 1 GHz**

**Operation Mode:** Normal Mode

| Frequency | Reading | Ant. factor | Cable loss | Ant. POL | Total | Limit | Margin |
|---|---|---|---|---|---|---|---|
| MHz | dBμV | dB /m | dB | (H/V) | dBμV/m | dBμV/m | dB |
| No Critical peaks found | | | | | | | |

**Notes:**

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. This test is performed with hopping off.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Operation Mode: CH Low(GFSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4804 | 55.99 | -2.96 | V | 53.03 | 73.98 | 20.95 | PK |
| 4804 | 50.17 | -2.96 | V | 47.21 | 53.98 | 6.77 | AV |
| 7206 | 48.94 | 6.88 | V | 55.82 | 73.98 | 18.16 | PK |
| 7206 | 38.40 | 6.88 | V | 45.28 | 53.98 | 8.70 | AV |
| 4804 | 57.41 | -2.96 | H | 54.45 | 73.98 | 19.53 | PK |
| 4804 | 52.06 | -2.96 | H | 49.1 | 53.98 | 4.88 | AV |
| 7206 | 49.82 | 6.88 | H | 56.7 | 73.98 | 17.28 | PK |
| 7206 | 39.43 | 6.88 | H | 46.31 | 53.98 | 7.67 | AV |

Operation Mode: CH Low(8DPSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4804 | 54.80 | -2.96 | V | 51.84 | 73.98 | 22.14 | PK |
| 4804 | 44.08 | -2.96 | V | 41.12 | 53.98 | 12.86 | AV |
| 7206 | 47.46 | 6.88 | V | 54.34 | 73.98 | 19.64 | PK |
| 7206 | 34.94 | 6.88 | V | 41.82 | 53.98 | 12.16 | AV |
| 4804 | 56.21 | -2.96 | H | 53.25 | 73.98 | 20.73 | PK |
| 4804 | 45.91 | -2.96 | H | 42.95 | 53.98 | 11.03 | AV |
| 7206 | 48.16 | 6.88 | H | 55.04 | 73.98 | 18.94 | PK |
| 7206 | 35.76 | 6.88 | H | 42.64 | 53.98 | 11.34 | AV |

Operation Mode: CH Low(π/4DQPSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4804 | 54.90 | -2.96 | V | 51.94 | 73.98 | 22.04 | PK |
| 4804 | 44.17 | -2.96 | V | 41.21 | 53.98 | 12.77 | AV |
| 7206 | 47.77 | 6.88 | V | 54.65 | 73.98 | 19.33 | PK |
| 7206 | 34.87 | 6.88 | V | 41.75 | 53.98 | 12.23 | AV |
| 4804 | 55.89 | -2.96 | H | 52.93 | 73.98 | 21.05 | PK |
| 4804 | 45.75 | -2.96 | H | 42.79 | 53.98 | 11.19 | AV |
| 7206 | 48.41 | 6.88 | H | 55.29 | 73.98 | 18.69 | PK |
| 7206 | 35.70 | 6.88 | H | 42.58 | 53.98 | 11.40 | AV |

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds. We performed using a reduced video BW method was done with the analyzer in linear mode.
6. FYI : Duty Cycle Correction Factor (79 channel hopping)
   a. Time to cycle through all channels= Δ t= τ [ms] x 79 channels = 229.100 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' =1*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 2.900 ms
   d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
7. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
   a. Time to cycle through all channels= Δ t= τ [ms] x 20 channels = 58.00 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' = 2*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 5.800 ms
   d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

e. We applied DCCF in the test result which hopping channel number is 20.

8. We have done Normal Mode and EDR Mode test.

9. This test is performed with hopping off.

10. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode: CH Mid(GFSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4882 | 55.36 | -2.60 | V | 52.76 | 73.98 | 21.22 | PK |
| 4882 | 49.27 | -2.60 | V | 46.67 | 53.98 | 7.31 | AV |
| 7323 | 48.74 | 6.11 | V | 54.85 | 73.98 | 19.13 | PK |
| 7323 | 38.39 | 6.11 | V | 44.50 | 53.98 | 9.48 | AV |
| 4882 | 56.37 | -2.60 | H | 53.77 | 73.98 | 20.21 | PK |
| 4882 | 51.15 | -2.60 | H | 48.55 | 53.98 | 5.43 | AV |
| 7323 | 49.51 | 6.11 | H | 55.62 | 73.98 | 18.36 | PK |
| 7323 | 38.93 | 6.11 | H | 45.04 | 53.98 | 8.94 | AV |

Operation Mode: CH Mid(8DPSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4882 | 54.25 | -2.60 | V | 51.65 | 73.98 | 22.33 | PK |
| 4882 | 43.45 | -2.60 | V | 40.85 | 53.98 | 13.13 | AV |
| 7323 | 47.82 | 6.11 | V | 53.93 | 73.98 | 20.05 | PK |
| 7323 | 35.19 | 6.11 | V | 41.30 | 53.98 | 12.68 | AV |
| 4882 | 55.44 | -2.60 | H | 52.84 | 73.98 | 21.14 | PK |
| 4882 | 45.10 | -2.60 | H | 42.50 | 53.98 | 11.48 | AV |
| 7323 | 48.43 | 6.11 | H | 54.54 | 73.98 | 19.44 | PK |
| 7323 | 35.52 | 6.11 | H | 41.63 | 53.98 | 12.35 | AV |

Operation Mode: CH Mid(π/4DQPSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4882 | 53.82 | -2.60 | V | 51.22 | 73.98 | 22.76 | PK |
| 4882 | 43.44 | -2.60 | V | 40.84 | 53.98 | 13.14 | AV |
| 7323 | 47.60 | 6.11 | V | 53.71 | 73.98 | 20.27 | PK |
| 7323 | 35.26 | 6.11 | V | 41.37 | 53.98 | 12.61 | AV |
| 4882 | 55.56 | -2.60 | H | 52.96 | 73.98 | 21.02 | PK |
| 4882 | 45.09 | -2.60 | H | 42.49 | 53.98 | 11.49 | AV |
| 7323 | 48.43 | 6.11 | H | 54.54 | 73.98 | 19.44 | PK |
| 7323 | 35.52 | 6.11 | H | 41.63 | 53.98 | 12.35 | AV |

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds. We performed using a reduced video BW method was done with the analyzer in linear mode.
6. FYI : Duty Cycle Correction Factor (79 channel hopping)
   a. Time to cycle through all channels= Δ t= τ [ms] x 79 channels = 229.100 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' =1*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 2.900 ms
   d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
7. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
   a. Time to cycle through all channels= Δ t= τ [ms] x 20 channels = 58.00 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' = 2*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 5.800 ms
   d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

e. We applied DCCF in the test result which hopping channel number is 20.

8. We have done Normal Mode and EDR Mode test.

9. This test is performed with hopping off.

10. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode: CH High(GFSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4960 | 55.01 | -2.53 | V | 52.48 | 73.98 | 21.50 | PK |
| 4960 | 48.94 | -2.53 | V | 46.41 | 53.98 | 7.57 | AV |
| 7440 | 49.00 | 5.73 | V | 54.73 | 73.98 | 19.25 | PK |
| 7440 | 37.05 | 5.73 | V | 42.78 | 53.98 | 11.20 | AV |
| 4960 | 56.86 | -2.53 | H | 54.33 | 73.98 | 19.65 | PK |
| 4960 | 51.57 | -2.53 | H | 49.04 | 53.98 | 4.94 | AV |
| 7440 | 48.83 | 5.73 | H | 54.56 | 73.98 | 19.42 | PK |
| 7440 | 37.81 | 5.73 | H | 43.54 | 53.98 | 10.44 | AV |

Operation Mode: CH High(8DPSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4960 | 54.42 | -2.53 | V | 51.89 | 73.98 | 22.09 | PK |
| 4960 | 43.13 | -2.53 | V | 40.60 | 53.98 | 13.38 | AV |
| 7440 | 47.49 | 5.73 | V | 53.22 | 73.98 | 20.76 | PK |
| 7440 | 34.51 | 5.73 | V | 40.24 | 53.98 | 13.74 | AV |
| 4960 | 56.39 | -2.53 | H | 53.86 | 73.98 | 20.12 | PK |
| 4960 | 45.43 | -2.53 | H | 42.90 | 53.98 | 11.08 | AV |
| 7440 | 48.03 | 5.73 | H | 53.76 | 73.98 | 20.22 | PK |
| 7440 | 34.77 | 5.73 | H | 40.50 | 53.98 | 13.48 | AV |

Operation Mode: CH High (π/4DQPSK)

| Frequency [MHz] | Reading DBuV | ※A.F+CL-AMP GAIN [dB] | ANT. POL [H/V] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|
| 4960 | 53.91 | -2.53 | V | 51.38 | 73.98 | 22.60 | PK |
| 4960 | 43.23 | -2.53 | V | 40.70 | 53.98 | 13.28 | AV |
| 7440 | 47.62 | 5.73 | V | 53.35 | 73.98 | 20.63 | PK |
| 7440 | 34.64 | 5.73 | V | 40.37 | 53.98 | 13.61 | AV |
| 4960 | 55.38 | -2.53 | H | 52.85 | 73.98 | 21.13 | PK |
| 4960 | 45.44 | -2.53 | H | 42.91 | 53.98 | 11.07 | AV |
| 7440 | 47.30 | 5.73 | H | 53.03 | 73.98 | 20.95 | PK |
| 7440 | 34.81 | 5.73 | H | 40.54 | 53.98 | 13.44 | AV |

※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds. We performed using a reduced video BW method was done with the analyzer in linear mode.
6. FYI : Duty Cycle Correction Factor (79 channel hopping)
   a. Time to cycle through all channels= Δ t= τ [ms] x 79 channels = 229.100 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' =1*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 2.900 ms
   d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
7. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
   a. Time to cycle through all channels= Δ t= τ [ms] x 20 channels = 58.00 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' = 2*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 5.800 ms
   d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

e. We applied DCCF in the test result which hopping channel number is 20.

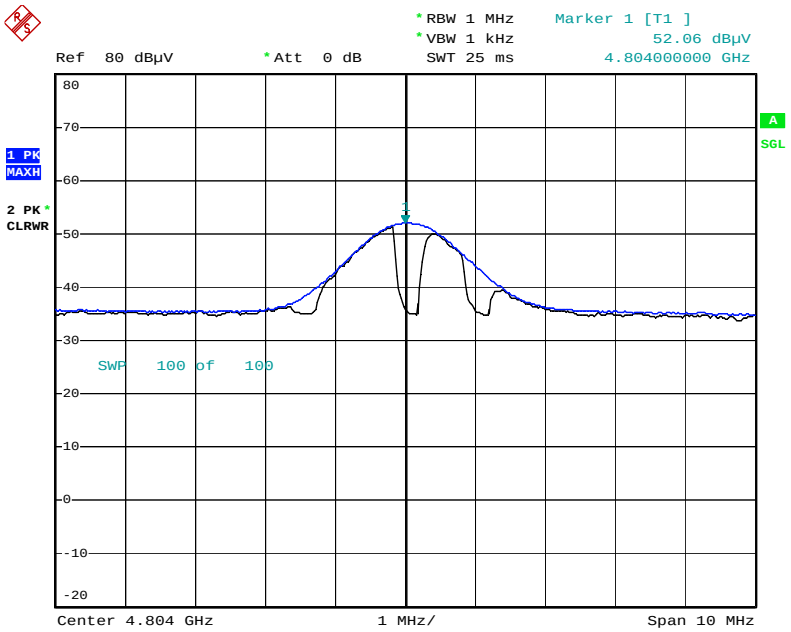
8. We have done Normal Mode and EDR Mode test.

9. This test is performed with hopping off.

10. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

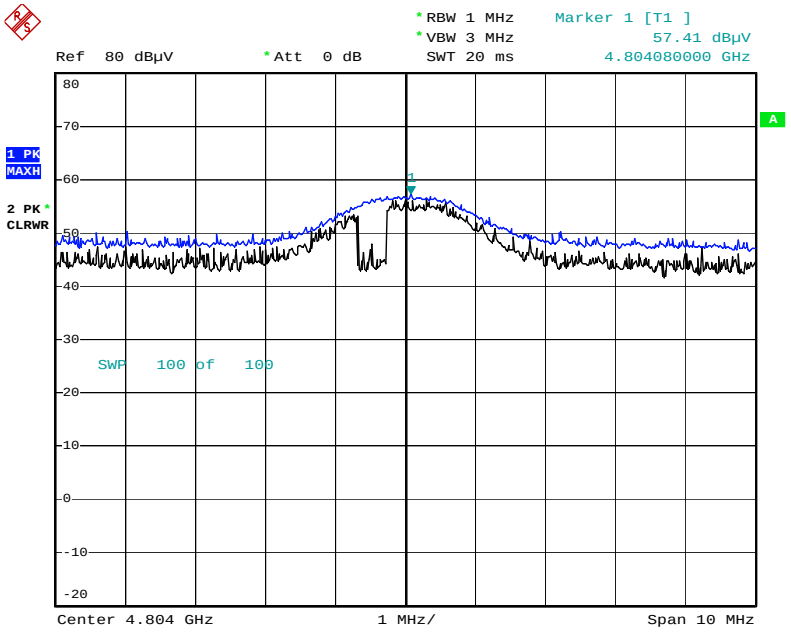
## ▣ RESULT PLOTS (Worst Case : y-H)

### Radiated Spurious Emissions plot – Average Reading (GFSK, Ch. Low 2rd Harmonic)



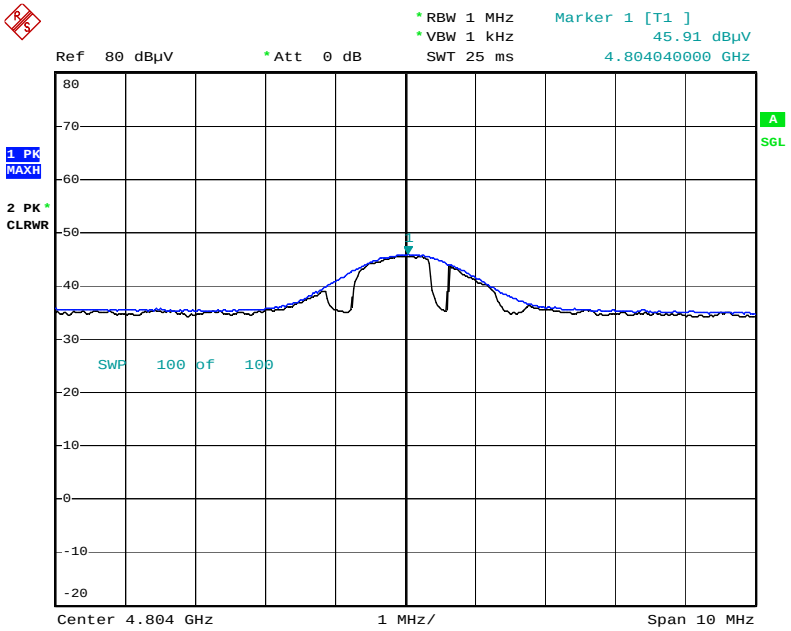

Date: 3.FEB.2016 16:47:40

### Radiated Spurious Emissions plot – Peak Reading (GFSK, Ch. Low 2rd Harmonic)



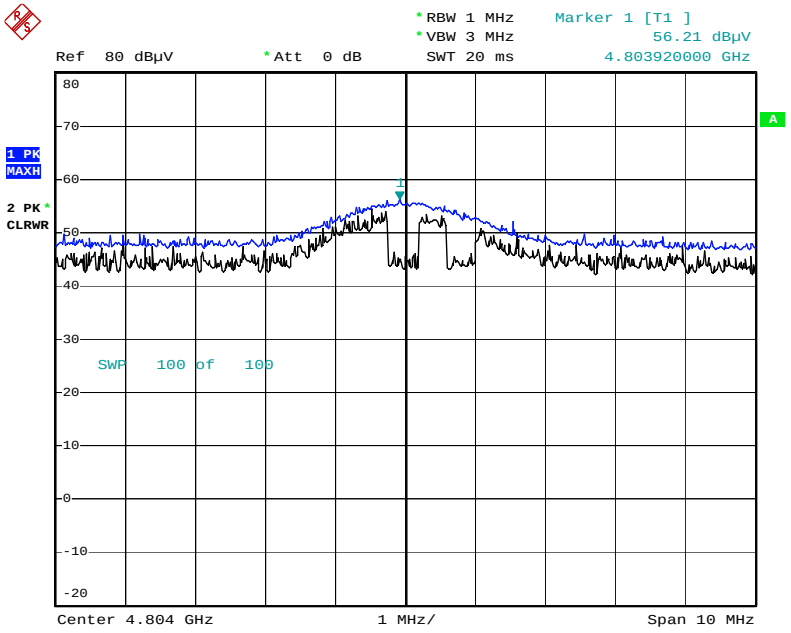

Date: 3.FEB.2016 16:47:24

## Radiated Spurious Emissions plot – Average Reading (8DPSK, Ch. Low 2rd Harmonic)



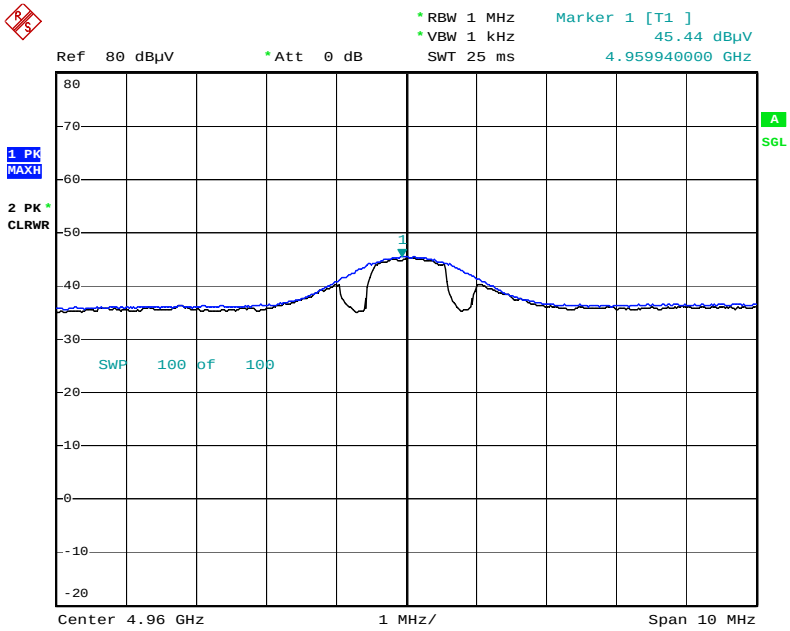

Date: 3.FEB.2016 16:48:25

## Radiated Spurious Emissions plot – Peak Reading (8DPSK, Ch. Low 2rd Harmonic)



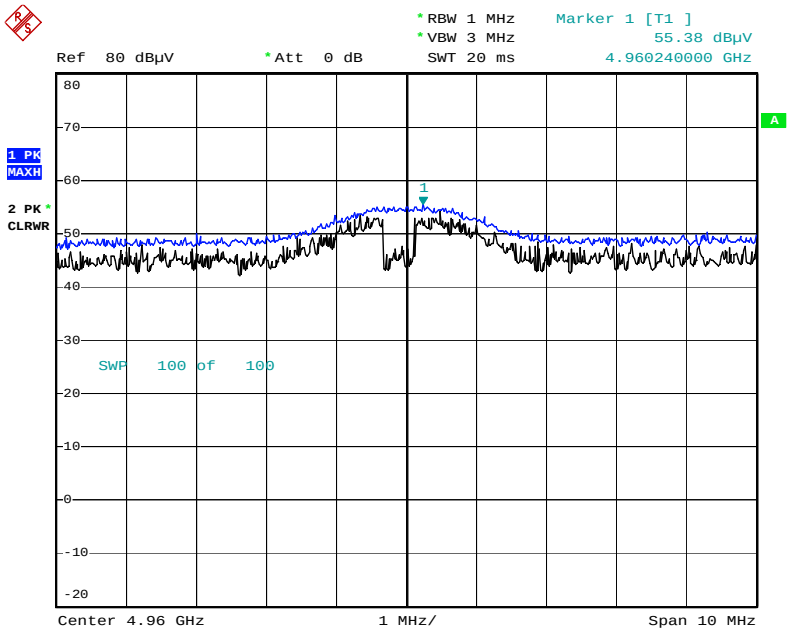

Date: 3.FEB.2016 16:48:53

## Radiated Spurious Emissions plot – Average Reading (π/4DQPSK, Ch. High 2rd Harmonic)




Date: 3.FEB.2016 16:45:36

## Radiated Spurious Emissions plot – Peak Reading (π/4DQPSK, Ch. High 2rd Harmonic)




Date: 3.FEB.2016 16:46:15

### 8.6.3 RADIATED RESTRICTED BAND EDGES

**Test Requirements and limit, §15.247(d), §15.205, §15.209**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c).

| | |
|---|---|
| Operation Mode | Normal(GFSK) |
| Operating Frequency | 2402 MHz, 2480 MHz |
| Channel No | CH 0, CH 78 |

| Frequency [MHz] | Reading dBuV | ※ A.F.+CL [dB] | Ant. Pol. [H/V] | Duty Cycle Correction [dB] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|---|
| 2390.0 | 25.57 | 31.31 | H | 0 | 56.88 | 73.98 | 17.10 | PK |
| 2390.0 | 12.41 | 31.31 | H | -24.73 | 18.99 | 53.98 | 34.99 | AV |
| 2390.0 | 25.39 | 31.31 | V | 0 | 56.70 | 73.98 | 17.28 | PK |
| 2390.0 | 12.35 | 31.31 | V | -24.73 | 18.93 | 53.98 | 35.05 | AV |
| 2483.5 | 34.54 | 31.37 | H | 0 | 65.91 | 73.98 | 8.07 | PK |
| 2483.5 | 32.03 | 31.37 | H | -24.73 | 38.67 | 53.98 | 15.31 | AV |
| 2483.5 | 34.23 | 31.37 | V | 0 | 65.60 | 73.98 | 8.38 | PK |
| 2483.5 | 31.25 | 31.37 | V | -24.73 | 37.89 | 53.98 | 16.09 | AV |

Operation Mode EDR(8DPSK)
Operating Frequency 2402 MHz , 2480 MHz
Channel No CH 0, CH 78

| Frequency [MHz] | Reading dBuV | ※ A.F.+CL [dB] | Ant. Pol. [H/V] | Duty Cycle Correction [dB] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|---|
| 2390.0 | 25.65 | 31.31 | H | 0 | 56.96 | 73.98 | 17.02 | PK |
| 2390.0 | 12.43 | 31.31 | H | -24.73 | 19.01 | 53.98 | 34.97 | AV |
| 2390.0 | 25.01 | 31.31 | V | 0 | 56.32 | 73.98 | 17.66 | PK |
| 2390.0 | 12.38 | 31.31 | V | -24.73 | 18.96 | 53.98 | 35.02 | AV |
| 2483.5 | 34.54 | 31.37 | H | 0 | 65.91 | 73.98 | 8.07 | PK |
| 2483.5 | 29.95 | 31.37 | H | -24.73 | 36.59 | 53.98 | 17.39 | AV |
| 2483.5 | 34.00 | 31.37 | V | 0 | 65.37 | 73.98 | 8.61 | PK |
| 2483.5 | 29.23 | 31.37 | V | -24.73 | 35.87 | 53.98 | 18.11 | AV |

Operation Mode EDR(π/4DQPSK)
Operating Frequency 2402 MHz , 2480 MHz
Channel No CH 0, CH 78

| Frequency [MHz] | Reading dBuV | ※ A.F.+CL [dB] | Ant. Pol. [H/V] | Duty Cycle Correction [dB] | Total [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Measurement Type |
|---|---|---|---|---|---|---|---|---|
| 2390.0 | 26.18 | 31.31 | H | 0 | 57.49 | 73.98 | 16.49 | PK |
| 2390.0 | 12.53 | 31.31 | H | -24.73 | 19.11 | 53.98 | 34.87 | AV |
| 2390.0 | 25.62 | 31.31 | V | 0 | 56.93 | 73.98 | 17.05 | PK |
| 2390.0 | 12.47 | 31.31 | V | -24.73 | 19.05 | 53.98 | 34.93 | AV |
| 2483.5 | 34.71 | 31.37 | H | 0 | 66.08 | 73.98 | 7.90 | PK |
| 2483.5 | 29.91 | 31.37 | H | -24.73 | 36.55 | 53.98 | 17.43 | AV |
| 2483.5 | 34.14 | 31.37 | V | 0 | 65.51 | 73.98 | 8.47 | PK |
| 2483.5 | 29.15 | 31.37 | V | -24.73 | 35.79 | 53.98 | 18.19 | AV |

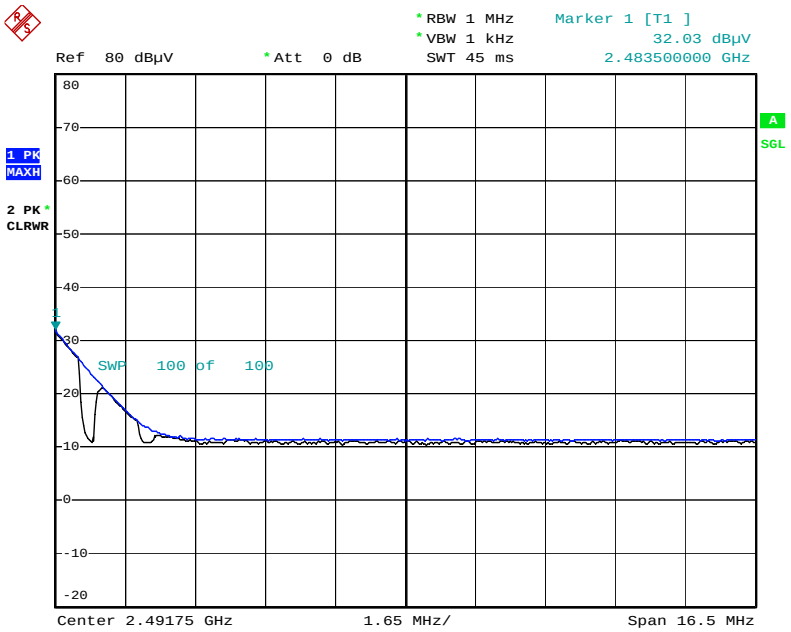
※ A·F: ANTENNA FACTOR
C·L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

**Notes:**

1. Frequency range of measurement = 2483.5 MHz ~ 2500 MHz
2. Total = Reading Value + Antenna Factor + Cable Loss + Duty Cycle Correction Factor
3. Spectrum setting:
   a. Peak Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW = 3 MHz.
   b. Average Setting 1 GHz – 25 GHz, RBW = 1 MHz, VBW ≥ 1/τ Hz, where τ = pulse width in seconds.
   We performed using a reduced video BW method was done with the analyzer in linear mode.
4. FYI : Duty Cycle Correction Factor (79 channel hopping)
   a. Time to cycle through all channels= Δ t= τ [ms] x 79 channels = 229.100 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' =1*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 2.900 ms
   d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
5. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
   a. Time to cycle through all channels= Δ t= τ [ms] x 20 channels = 58.00 ms, where τ = pulse width
   b. 100 ms/ Δt [ms] = *H* → Round up to next highest integer, *H ' = 2*
   c. Worst Case Dwell Time = τ [ms] x *H '* = 5.800 ms
   d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB
   e. We applied DCCF in the test result which hopping channel number is 20.
6. We have done Normal Mode, EDR Mode.
7. This test is performed with hopping off.
8. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

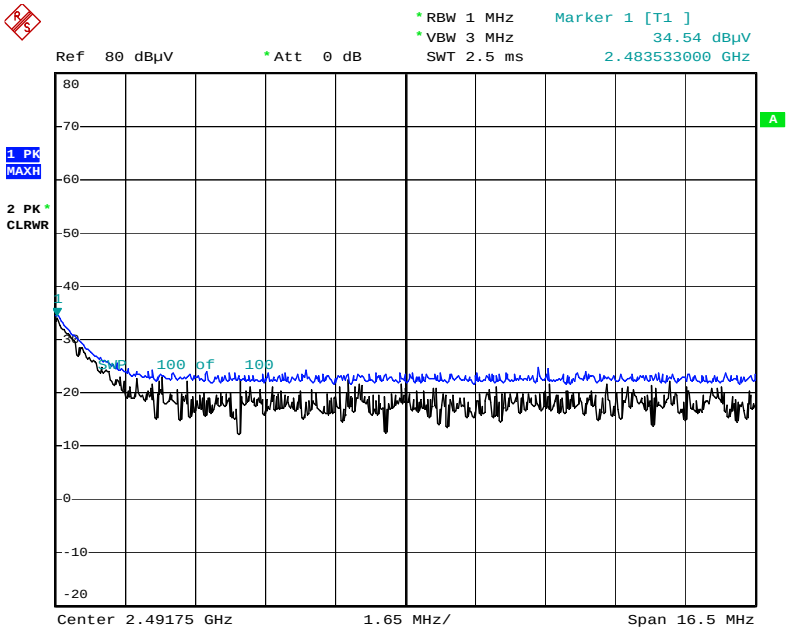
## ▣ RESULT PLOTS (Worst Case : x-H)

### Radiated Restricted Band Edges plot – Average Reading (GFSK, Ch.78)




Date: 3.FEB.2016 16:14:34

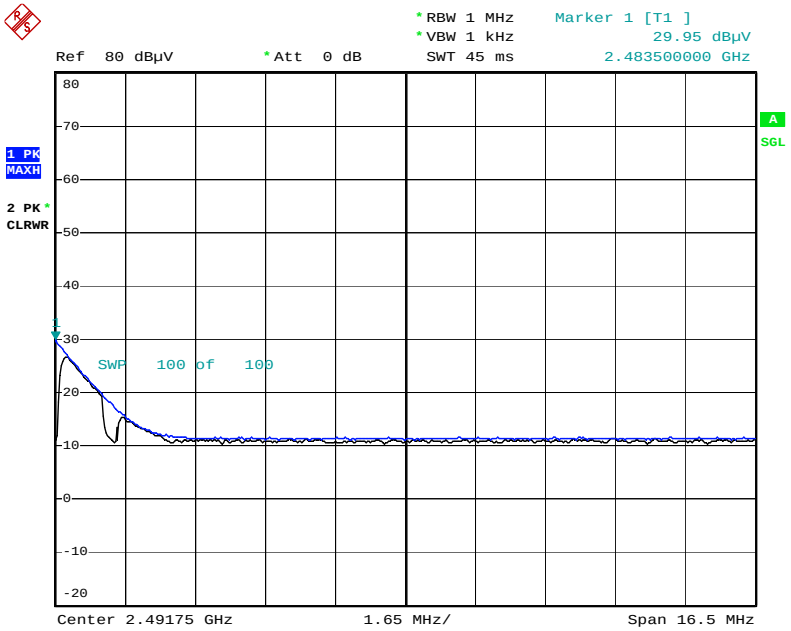
### Radiated Restricted Band Edges plot – Peak Reading (GFSK, Ch.78)




Date: 3.FEB.2016 16:14:17

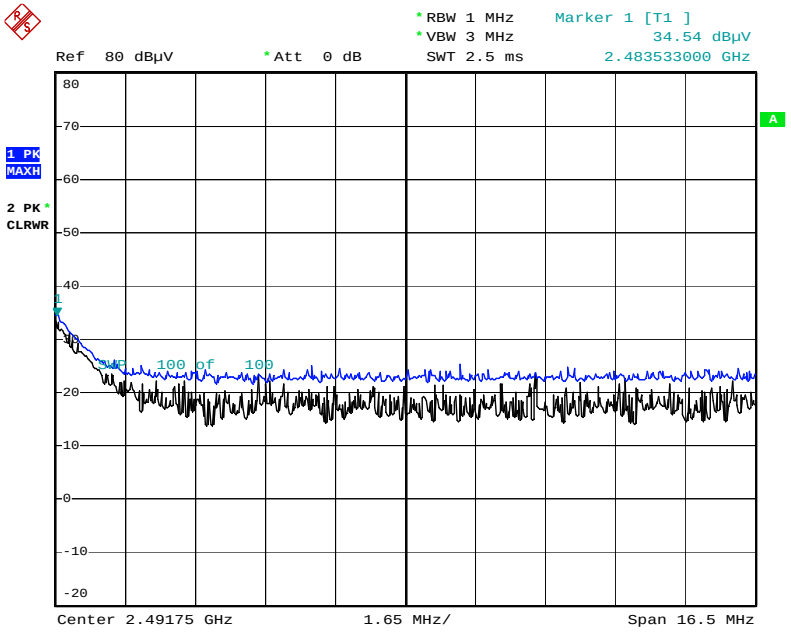
**Note : Only the worst case plots for Radiated Restricted Band Edges.**

## Radiated Restricted Band Edges plot – Average Reading (8DPSK, Ch.78)




Date: 3.FEB.2016 16:16:17

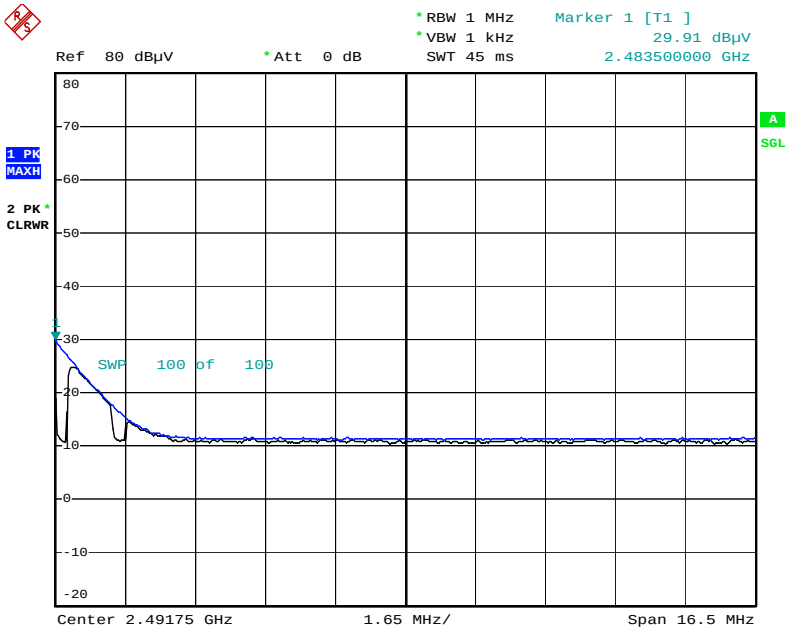
## Radiated Restricted Band Edges plot – Peak Reading (8DPSK, Ch.78)




Date: 3.FEB.2016 16:15:59

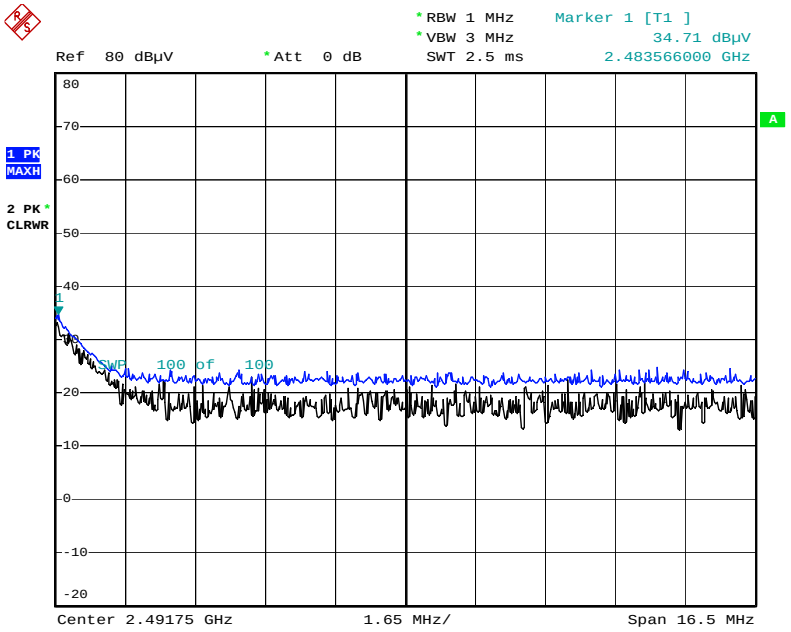
**Note : Only the worst case plots for Radiated Restricted Band Edges.**

## Radiated Restricted Band Edges plot – Average Reading (π/4DQPSK, Ch.78)




Date: 3.FEB.2016 16:15:20

## Radiated Restricted Band Edges plot – Peak Reading (π/4DQPSK, Ch.78)




Date: 3.FEB.2016 16:15:42

**Note : Only the worst case plots for Radiated Restricted Band Edges.**

## 8.7 POWERLINE CONDUCTED EMISSIONS

**LIMIT**

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolt (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

**Test Configuration**

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

**TEST PROCEDURE**

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

**Sample Calculation**

Quasi-peak(Final Result) = Reading Value + Correction Factor

## ▣ RESULT PLOTS

**Conducted Emissions (Line 1)**

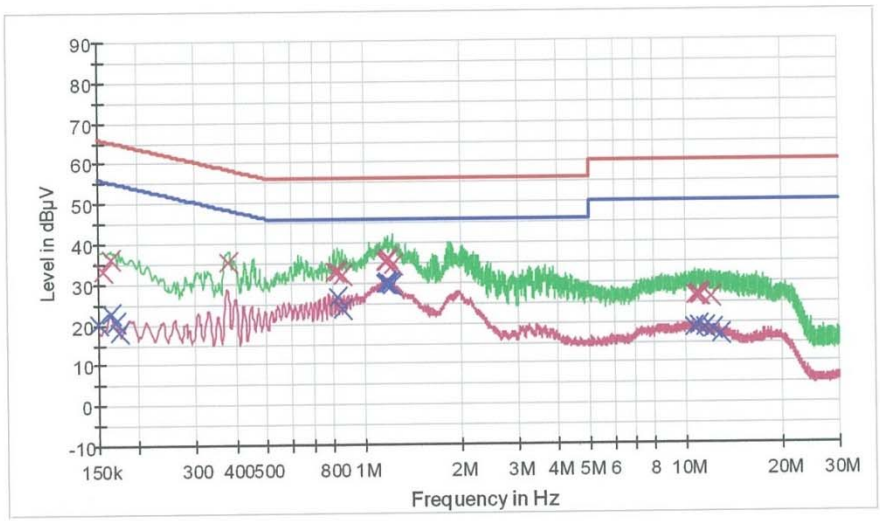
EMI Auto Test(15) 1 / 2

# HCT TEST Report

## Common Information

| | |
|---|---|
| EUT: | SM-J5108 |
| Manufacturer: | SAMSUNG |
| Test Site: | SHIELD ROOM |
| Operating Conditions: | BT MODE |
| Operator Name | SK LEE |

FCC CLASS B




FCC CLASS B_QP
Preview Result 2-AVG
FCC CLASS B_ AV
Final Result 1-QPK
Preview Result 1-PK+
Final Result 2-CAV

## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.156000 | 33.2 | 9.000 | Off | L1 | 9.6 | 32.5 | 65.7 |
| 0.164000 | 36.0 | 9.000 | Off | L1 | 9.6 | 29.3 | 65.3 |
| 0.380000 | 35.6 | 9.000 | Off | L1 | 9.7 | 22.7 | 58.3 |
| 0.806000 | 32.8 | 9.000 | Off | L1 | 9.7 | 23.2 | 56.0 |
| 0.828000 | 32.8 | 9.000 | Off | L1 | 9.7 | 23.2 | 56.0 |
| 0.854000 | 32.1 | 9.000 | Off | L1 | 9.7 | 23.9 | 56.0 |
| 1.160000 | 35.3 | 9.000 | Off | L1 | 9.7 | 20.7 | 56.0 |
| 1.178000 | 35.6 | 9.000 | Off | L1 | 9.7 | 20.4 | 56.0 |
| 1.188000 | 36.0 | 9.000 | Off | L1 | 9.7 | 20.0 | 56.0 |
| 1.194000 | 36.0 | 9.000 | Off | L1 | 9.7 | 20.0 | 56.0 |
| 1.226000 | 34.7 | 9.000 | Off | L1 | 9.7 | 21.3 | 56.0 |
| 1.236000 | 34.5 | 9.000 | Off | L1 | 9.7 | 21.5 | 56.0 |
| 10.732000 | 26.4 | 9.000 | Off | L1 | 10.0 | 33.6 | 60.0 |
| 10.740000 | 26.5 | 9.000 | Off | L1 | 10.0 | 33.5 | 60.0 |
| 10.898000 | 27.1 | 9.000 | Off | L1 | 10.1 | 32.9 | 60.0 |
| 10.914000 | 26.6 | 9.000 | Off | L1 | 10.1 | 33.4 | 60.0 |

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EMI Auto Test(15) 2 / 2

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 11.072000 | 26.5 | 9.000 | Off | L1 | 10.1 | 33.5 | 60.0 |
| 11.974000 | 26.3 | 9.000 | Off | L1 | 10.1 | 33.7 | 60.0 |

## Final Result 2

| Frequency (MHz) | CAverage (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.150000 | 20.2 | 9.000 | Off | L1 | 9.7 | 35.8 | 56.0 |
| 0.164000 | 23.0 | 9.000 | Off | L1 | 9.6 | 32.3 | 55.3 |
| 0.170000 | 20.6 | 9.000 | Off | L1 | 9.6 | 34.4 | 55.0 |
| 0.174000 | 18.0 | 9.000 | Off | L1 | 9.6 | 36.8 | 54.8 |
| 0.828000 | 26.4 | 9.000 | Off | L1 | 9.7 | 19.6 | 46.0 |
| 0.856000 | 23.8 | 9.000 | Off | L1 | 9.7 | 22.2 | 46.0 |
| 1.158000 | 29.9 | 9.000 | Off | L1 | 9.7 | 16.1 | 46.0 |
| 1.178000 | 29.9 | 9.000 | Off | L1 | 9.7 | 16.1 | 46.0 |
| 1.184000 | 30.2 | 9.000 | Off | L1 | 9.7 | 15.8 | 46.0 |
| 1.194000 | 29.9 | 9.000 | Off | L1 | 9.7 | 16.1 | 46.0 |
| 1.204000 | 29.9 | 9.000 | Off | L1 | 9.7 | 16.1 | 46.0 |
| 1.216000 | 29.7 | 9.000 | Off | L1 | 9.7 | 16.3 | 46.0 |
| 10.538000 | 18.8 | 9.000 | Off | L1 | 10.0 | 31.2 | 50.0 |
| 10.898000 | 18.8 | 9.000 | Off | L1 | 10.1 | 31.2 | 50.0 |
| 11.002000 | 19.0 | 9.000 | Off | L1 | 10.1 | 31.0 | 50.0 |
| 11.486000 | 18.6 | 9.000 | Off | L1 | 10.1 | 31.4 | 50.0 |
| 12.080000 | 18.2 | 9.000 | Off | L1 | 10.1 | 31.8 | 50.0 |
| 12.836000 | 17.1 | 9.000 | Off | L1 | 10.1 | 32.9 | 50.0 |

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**Conducted Emissions (Line 2)**

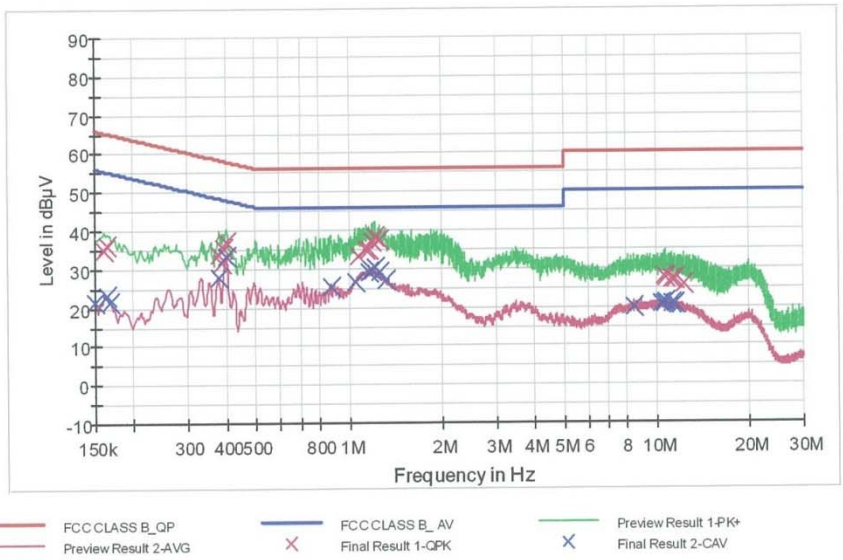
EMI Auto Test(15) 1 / 2

# HCT TEST Report

## Common Information

| | |
|---|---|
| EUT: | SM-J5108 |
| Manufacturer: | SAMSUNG |
| Test Site: | SHIELD ROOM |
| Operating Conditions: | BT MODE |
| Operator Name | SK LEE |

FCC CLASS B




## Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.160000 | 34.8 | 9.000 | Off | N | 9.6 | 30.7 | 65.5 |
| 0.164000 | 36.2 | 9.000 | Off | N | 9.6 | 29.1 | 65.3 |
| 0.380000 | 33.5 | 9.000 | Off | N | 9.6 | 24.8 | 58.3 |
| 0.388000 | 31.5 | 9.000 | Off | N | 9.6 | 26.6 | 58.1 |
| 0.394000 | 35.5 | 9.000 | Off | N | 9.6 | 22.5 | 58.0 |
| 0.400000 | 37.2 | 9.000 | Off | N | 9.6 | 20.7 | 57.9 |
| 1.070000 | 33.1 | 9.000 | Off | N | 9.7 | 22.9 | 56.0 |
| 1.140000 | 35.1 | 9.000 | Off | N | 9.7 | 20.9 | 56.0 |
| 1.162000 | 35.1 | 9.000 | Off | N | 9.7 | 20.9 | 56.0 |
| 1.188000 | 37.2 | 9.000 | Off | N | 9.7 | 18.8 | 56.0 |
| 1.212000 | 38.5 | 9.000 | Off | N | 9.7 | 17.5 | 56.0 |
| 1.260000 | 37.5 | 9.000 | Off | N | 9.7 | 18.5 | 56.0 |
| 10.542000 | 27.9 | 9.000 | Off | N | 10.0 | 32.1 | 60.0 |
| 10.734000 | 27.2 | 9.000 | Off | N | 10.0 | 32.8 | 60.0 |
| 10.756000 | 27.3 | 9.000 | Off | N | 10.0 | 32.7 | 60.0 |
| 11.164000 | 26.8 | 9.000 | Off | N | 10.0 | 33.2 | 60.0 |

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EMI Auto Test(15) 2 / 2

| Frequency (MHz) | QuasiPeak (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 11.410000 | 27.1 | 9.000 | Off | N | 10.0 | 32.9 | 60.0 |
| 12.220000 | 25.9 | 9.000 | Off | N | 10.1 | 34.1 | 60.0 |

## Final Result 2

| Frequency (MHz) | CAverage (dBµV) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|---|---|---|---|---|---|---|---|
| 0.150000 | 21.6 | 9.000 | Off | N | 9.6 | 34.4 | 56.0 |
| 0.164000 | 23.3 | 9.000 | Off | N | 9.6 | 32.0 | 55.3 |
| 0.168000 | 21.7 | 9.000 | Off | N | 9.6 | 33.4 | 55.1 |
| 0.378000 | 27.9 | 9.000 | Off | N | 9.6 | 20.4 | 48.3 |
| 0.400000 | 33.4 | 9.000 | Off | N | 9.6 | 14.5 | 47.9 |
| 0.874000 | 25.4 | 9.000 | Off | N | 9.7 | 20.6 | 46.0 |
| 1.046000 | 26.4 | 9.000 | Off | N | 9.7 | 19.6 | 46.0 |
| 1.162000 | 29.3 | 9.000 | Off | N | 9.7 | 16.7 | 46.0 |
| 1.188000 | 29.4 | 9.000 | Off | N | 9.7 | 16.6 | 46.0 |
| 1.212000 | 30.3 | 9.000 | Off | N | 9.7 | 15.7 | 46.0 |
| 1.260000 | 28.9 | 9.000 | Off | N | 9.7 | 17.1 | 46.0 |
| 1.316000 | 27.0 | 9.000 | Off | N | 9.7 | 19.0 | 46.0 |
| 8.414000 | 19.8 | 9.000 | Off | N | 9.9 | 30.2 | 50.0 |
| 10.316000 | 20.8 | 9.000 | Off | N | 10.0 | 29.2 | 50.0 |
| 10.550000 | 20.6 | 9.000 | Off | N | 10.0 | 29.4 | 50.0 |
| 10.734000 | 20.9 | 9.000 | Off | N | 10.0 | 29.1 | 50.0 |
| 11.164000 | 20.7 | 9.000 | Off | N | 10.0 | 29.3 | 50.0 |
| 11.410000 | 20.7 | 9.000 | Off | N | 10.0 | 29.3 | 50.0 |

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Note : The Worst case of Conducted Emission is standalone mode.

# 9. LIST OF TEST EQUIPMENT

## 9.1 LIST OF TEST EQUIPMENT(Conducted Test)

| Manufacturer | Model / Equipment | Calibration Date | Calibration Interval | Serial No. |
|---|---|---|---|---|
| Rohde & Schwarz | ENV216/ LISN | 12/28/2015 | Annual | 100073 |
| Agilent | E4440A/ Spectrum Analyzer | 03/18/2015 | Annual | US45303008 |
| Agilent | N9020A / SIGNAL ANALYZER | 06/30/2015 | Annual | MY51110085 |
| Agilent | N9020A / SIGNAL ANALYZER | 07/02/2015 | Annual | MY50510304 |
| Agilent | N1911A/Power Meter | 07/09/2015 | Annual | MY45100523 |
| Agilent | N1921A /POWER SENSOR | 07/09/2015 | Annual | MY45241059 |
| Agilent | 87300B/Directional Coupler | 11/30/2015 | Annual | 3116A03621 |
| Hewlett Packard | 11667B / Power Splitter | 06/15/2015 | Annual | 5001 |
| Hewlett Packard | E3632A / DC POWER SUPPLY | 03/11/2015 | Annual | KR75303962 |
| Agilent | 8493C / Attenuator(10 dB) | 07/23/2015 | Annual | 07560 |
| Rohde & Schwarz | CBT / BLUETOOTH TESTER | 05/11/2015 | Annual | 100422 |

## 9.2 LIST OF TEST EQUIPMENT(Radiated Test)

| Manufacturer | Model / Equipment | Calibration Date | Calibration Interval | Serial No. |
|---|---|---|---|---|
| Schwarzbeck | VULB 9160/ TRILOG Antenna | 10/10/2014 | Biennial | 3368 |
| HD | MA240/ Antenna Position Tower | N/A | N/A | 556 |
| EMCO | 1050/ Turn Table | N/A | N/A | 114 |
| HD GmbH | HD 100/ Controller | N/A | N/A | 13 |
| HD GmbH | KMS 560/ SlideBar | N/A | N/A | 12 |
| CERNEX | CBL18265035 / POWER AMP | 07/27/2015 | Annual | 22966 |
| Schwarzbeck | BBHA 9120D/ Horn Antenna | 05/07/2015 | Biennial | 937 |
| Schwarzbeck | BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz) | 04/30/2015 | Biennial | BBHA9170124 |
| Rohde & Schwarz | FSP / Spectrum Analyzer | 01/15/2016 | Annual | 839117/011 |
| Wainwright Instrument | WHF3.0/18G-10EF / High Pass Filter | 06/29/2015 | Annual | 8 |
| Wainwright Instrument | WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter | 06/15/2015 | Annual | 1 |
| Rohde & Schwarz | LOOP ANTENNA | 02/18/2014 | Biennial | 100179 |
| CERNEX | CBL06185030 / POWER AMP | 07/21/2015 | Annual | 22965 |
| CERNEX | CBLU1183540 / POWER AMP | 07/21/2015 | Annual | 22964 |
| Rohde & Schwarz | CBT / BLUETOOTH TESTER | 05/11/2015 | Annual | 100422 |